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ABSTRACT

This is the leader's guide and training materials for conducting workshops on an instructional system which utilizes the process of inquiry. The guide is designed for leaders of these workshops and lists the leader's activities. It is organized according to the 18 major workshop experiences, referred to as subset. Each subset guide is organized into four parts: (1) activities of the subset, including time allotments for each activity; (2) directions and/or comments the leader reads at each of the subset activities; (3) the rationale for each activity and its location in the training design; and (4) materials the leader needs to have ready for the activities during a subset. The titles of some of these subsets include "Inquirer Behavior," "Evaluating Teamwork Relationships," and "Facilitating Growth Moves." Also included are the participants' handouts for each subset. Appended are transparencies, learning objectives, typescripts of confrontation tapes, and workshop designs. (RC)

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Leader's Guide:

Facilitating Inquiry in the Classroom

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Regional
Educational
Laboratory

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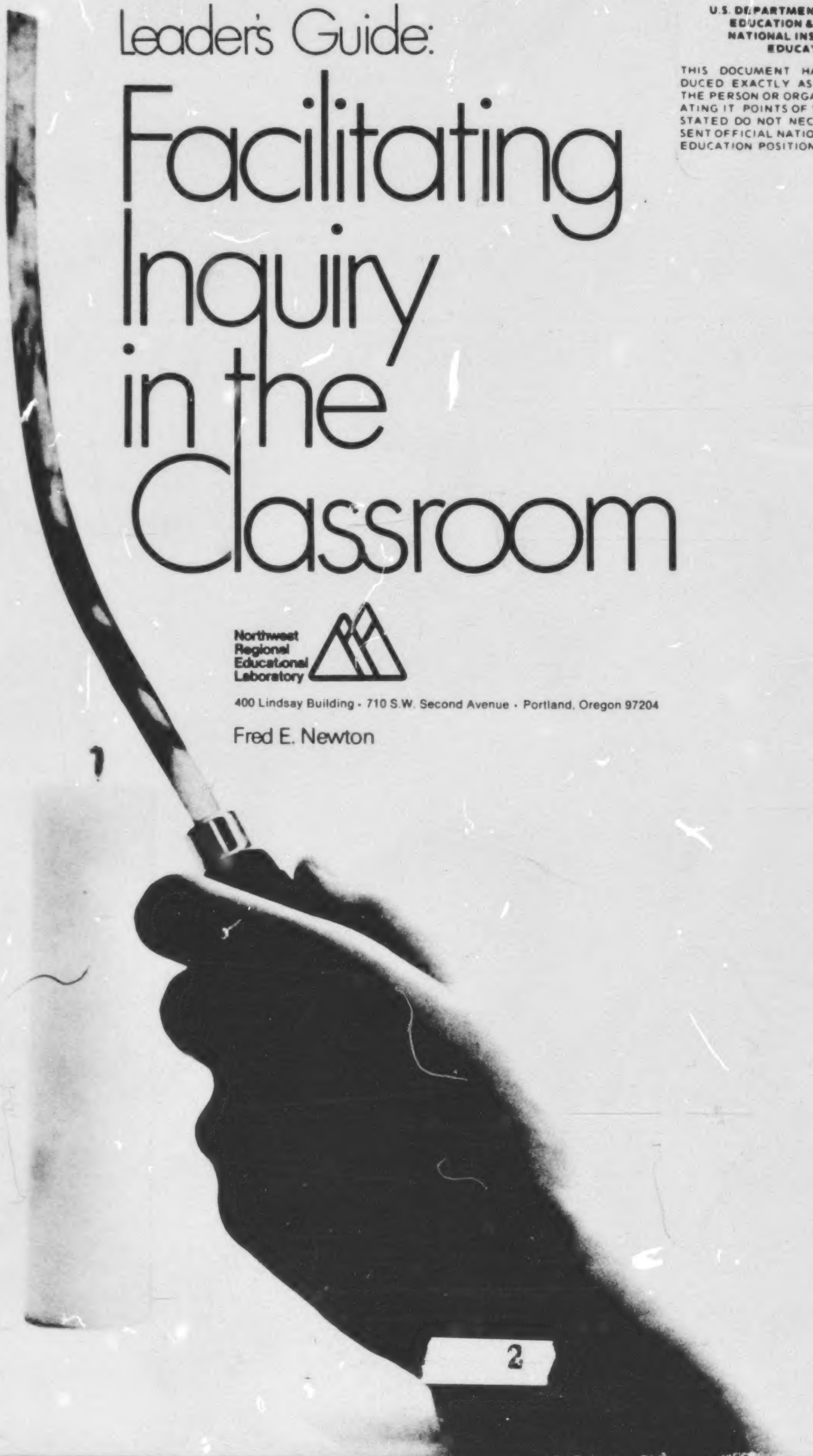

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LEADER'S GUIDE:
FACILITATING INQUIRY IN THE CLASSROOM

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PREFACE

In a world of increasingly rapid change, the orientation and skills of active learning become critical. The process of inquiry is central among those skills. The individual must recognize and reconcile the discrepant events of his life situation. He must explore and create his life style and self from an awareness of a growing array of alternatives. He must at least understand his ultimate contribution to, if not also be directly involved in, the exploration and creation of man's evolution. Such is the historical era we have reached. The past focus of education has been on how things *are*. The new era demands that we also focus on how things *become*. We need usable understandings of processes as well as a knowledge of facts.

Gaining usable understandings of a process such as inquiry is more complex than most learning. For a process to be truly usable, a person must be able to perform its behaviors as well as to understand its theories. With this system, he will learn not only to use the behaviors of inquiry as he is interacting with pupils but also to support their use of them. He will learn to look very literally at his actions and those of pupils, making sure they match the intentions and are relevant to the current needs and motivations. His understanding of this process must be internalized as congruent with his individual humanness. Ultimately, use of inquiry behaviors should not be mechanistic or externally prescribed. Such learning, however, demands greater exposure of our selves and more willingness to help each other than typically occurs in the classroom.

There are two major assumptions of this learning design which need to be shared. First is that the behaviors and orientation of inquiry are already deeply inbedded in a person's experience of learning and growing. Participants are not asked to learn things which are basically new to their experience. Rather, they are asked to increase their understanding and control of this common human process. Similar to the process of driving a car, skill increases when attention is focused on the behaviors involved and the rationale for them.

The second major assumption is that inquiry is only one of many human processes which can be prescribed only by the individual. This training tries to assure a clear awareness of when, and how well, he uses the behaviors of the process and the behaviors that help others gain mastery of it. It does not tell an individual when or whether to use such behaviors. This will always be a personal decision. The idea, here, is to increase one's personal repertoire of process behaviors, and to be more able to provide similar assistance to others. Each individual thus becomes more aware and autonomous in using his behavior to explore and create.

Five years of experimentation have brought this set of training materials to its present stage. They are based on the earlier work of Suchman and Strasser. Many creative people have contributed to their development under the direction of Fred Newton. This has been a pioneering effort in seeking to create mass diffusable techniques to provide learning which gives usable understandings of processes. While there is still clearly much to be discovered about helping people learn to use their human processes, you will find the progress represented in this package powerful and exciting.

Charles C. Jung,
Coordinator
Improving Teacher Competencies Program

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INTRODUCTION

Development of this instructional system has reached the point where, supported by empirical evidence, it is ready to be placed in the hands of leaders. Furthermore, it is likely these leaders have had little more training than that provided by the system itself. This is not to say the system is perfect or leader proof. Indeed, there are weaknesses within the system that have become the basis for future revision.* Nor does it mean the need for a leader is in any way minimized. Someone is needed to carry out the key leadership functions. The original intent, however, was to develop a system that did not require the expertise of a highly skilled leader. In this way the system could be led by a person having gone through it once. For this to happen, the leader needed more information than was available to him as a workshop participant. It is the purpose of this introduction to provide such inputs.

WHAT THE LEADER DOES

This instructional system has been designed so the leader is responsible for group task functions. Task functions are those that help the group complete the required workshop learning.

Make Arrangements for Resources

There must be some critical resource available if the workshop participants are to complete the intended learning. It is the leader's task to see the critical resources are available when needed. Such resources include: an adequate meeting place, students for practice sessions, audiovisual equipment and leader-training materials.

Select and Maintain Time Schedule

There are two designs for conducting the workshop. Both require between 40-45 hours of workshop learning time. The fourteen-meeting design fits the usual extension class or Division of Continuing Education schedule. The seven-meeting design requires full, six-hour days. Further notes on the schedule of each are found in Appendix D, pages 423-424. It is necessary, then, for the leader to select the design that best meets the time needs and constraints of the participants.

Each workshop subset and the activities within subsets have time periods identified. These are found in the Leader Guide. Although time periods for the subset activities are not sacred, they have been checked and found reasonable for the groups tested. A leader may find he needs to alter established times to meet some immediate and unanticipated need.

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*A prospective leader should read the complete technical report to become familiar with the strength and weaknesses of the system. For a copy of Technical Report No. 5: Inquiry, contact the Communications Division, Northwest Regional Educational Laboratory, 400 Lindsay Building, 710 S. W. Second, Portland, Oregon 97204.

Select and Maintain Time Schedule

However, for the most part, the subset and activity times should be adhered to. It becomes the leader's task to see that participants are involved in all learning tasks. A kitchen timer is a good devide to keep to the indicated times. Leader and participants will respond to it automatically.

Distribute Materials

A list of materials needed for the workshop is found on page 7 You will note that all participant materials are contained in a prepackaged set. Some (blue) have been placed at the back of each set (Handouts 4.3; 5.17; 6.3-6.10). These should be collected by the leader at the beginning of each workshop and redistributed when called for by the subset directions.

Select Meeting Place

Physical arrangements for the workshop require a large meeting hall with movable chairs and tables. This enables four groups of six members each to meet, play tape recorders without interfering with one another, and yet hear the leader's directions. The meeting place is an important resource. If people can't spread out and still be in contact with the leader, then, forget the workshop. Since such facilities are often hard to come by for large groups, the recommended size for the Facilitating Inquiry workshop is 24 participants.

It is especially nice for the seven-meeting workshop design if kitchen facilities are available for coffee and snacks.

Arrange for Tape Recorder and Tapes

Each participant will be making tape recordings during the workshop enactment and practice activities. During the enactment activities four tape recorders will be needed at the workshop meeting place. During the practice activities each participant will be recording in a classroom. The leader will need to arrange for these recorders.

Unless the leader wants to collect the taped practice and enactment activities, he can ask participants to furnish their own recording tapes. The small size (a 2½" reel) used as mailers is all that is needed.

Arrange for Students

During the four practice activities, each participant needs to work with eight to fifteen students. Depending upon the workshop design being followed (seven or fourteen days), participants may be able to use their own classroom groups for practice. If this isn't possible, it may be necessary to bring students to the workshop site or arrange for participants to use other groups of students. The need for students for the practice activities should be taken into consideration when the workshop meeting place is being selected.

Give Directions

The Leader Guide is organized by the major workshop experiences, referred to as subsets. Each subset guide is organized into four parts:

1. ACTIVITIES of the subset, including time allotments for each activity
2. DIRECTIONS and/or comments the leader reads at each of the subset activities
3. RATIONALE for each activity and its location in the training design
4. MATERIALS the leader needs to have ready for the activities during a subset

Although revisions for improvement will continue, care has been taken and tests have been made to write leader directions that communicate clearly:

1. IDEAS the participant will be working with
2. TASKS the participant will engage in to work with the idea
3. Participant OBJECTIVES for the task
4. RELATIONSHIPS of the current task and its objectives to past and/or future tasks and objectives
5. Any SECONDARY TASKS that are a part of the subset

Therefore, it is recommended the leader read the directions to the participants. If, for whatever reason, this procedure is perceived as abhorrent by the leader, he should spend time rewriting his own directions and comments. Make sure to include all the points in the tested directions. If participants appear confused, if they sit without getting started, if they aren't doing the assigned task, then the leader should begin his analyis of the situation by looking at his own directions. More time is lost, more experiences screwed up, and more frustrated participants and leaders are caused by poor directions than by any other single factor. (My theory!)

Respond to Participants

Workshop experiences have been designed, written and organized so trio and small group members are responsible for the maintenance function of the learning group. The maintenance function is one that contributes to group cohesion and team relationships. At times where the workshop leader is primarily responsible for the task functions of the group, he

Respond to Participants

needs to contribute to the group maintenance function. When he is aware of a need for group maintenance he should step in and work with them, keeping in mind the task of the total group. That is, he needs to see that the learning tasks are completed for all workshop participants. Admittedly, this is a ticklish task at times.

Use Allowing Inquiry Moves

In Subset 2, the leader provides a problem focus for participant inquiry. It requires the leader to use only the allowing inquiry moves.

Demonstrate

On three occasions the leader is asked to demonstrate physical science events. Information and material lists for these demonstrations appear in the appropriate subsets.

Make Visual Aids

Workshop themes and schedules of activities are displayed before participants on charts or overhead transparencies. Overhead transparency masters for the workshop themes and subset schedules are provided in Appendix A, pages 380-400, but it is the leader's task to duplicate them.

The leader also is asked to make some identification tags which the inquirers wear during the enacting activities. At one point in the workshop, it is necessary for the leader to reproduce or make a display chart of participant's "risk and advantage" statements.

Prepare Instructions

Prior to the beginning of the workshop and before each subset the leader should spend time going over the Leader Guide. There are some key experiences for which the leader needs particular preparation.

Arrange for Odd Number of Participants

If the leader finds he has a different number than 24 participants,some of the following hints should help him alter arrangements.

If there are one or two extras after participants have formed trios, add each of them to a trio to make a quartet.

Always try to combine trios (and/or quartets if this is necessary) to have groups of six or seven. Try to avoid groups of five and/or eight members. For example, combine a trio with a quartet for a small group.

If it is necessary to have a quartet(s) during a trio exercise, the extra person should double up to serve in an "active" task. For example, in Subset 5, the extra member also should serve as teacher; in Subset 18, he should double up as another observer and report.

Arrange for Odd Number of Participants

If it is necessary to have groups with more or less than six members, particularly during enactments, the following procedures are recommended:

1. Where there is a group of five, use only one observer
2. Where there is a group of seven, use the seventh person as an additional inquirer
3. Where there is a group of eight, use the seventh person as an additional inquirer and the eighth person as an additional observer

When, because of different size groups, the timing is thrown off, have those groups finishing first observe other groups as casual observers. They should use guide sheets but not report.

Where a trio member is absent, one member can take on two tasks, for instance, in Subset 5, the student can also be the answer man. Also, the workshop leader may be able to sit in as the third member.

Review Risk and Advantage Statements

The Leader Guide does not identify for the leader a schedule for reviewing risk and advantage statements. However, following Subset 3 the leader should plan for time periods, generally at the beginning or end of the meeting, when he can review the statements with participants. The key is to not spend a great deal of time discussing. It may be well not to review risk and advantage statements on the day that participants make first practice tape.

Explain Force Field Analysis

In Subset 7 the leader will need to read through the information provided to familiarize himself with the force field analysis technique.

Assess The Workshop

Although the leader can familiarize himself with the effects of the facilitating inquiry instructional system as described in the Technical Report No. 5: Inquiry, he also may be interested in assessing what's happening within the immediate workshop. Provided in the Appendix B is a form which he can use to carry out such an assessment after each subset. It provides the leader with information from participants concerning productivity and clarity of task and group maintenance. The leader wishing to use this form will need to reproduce his own copies.

LEARNING OBJECTIVES

The charts titled Learning Objectives, Appendix B, include the specific participant objectives for each of the subsets as they relate to anticipated broader, internalized change in participants.

SHARING

If, in serving as a leader for this instructional system, you wish to share with us your successes, failures, recommendations and criticisms about the system or any part of it, do so. Your reactions will be welcome.

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MATERIAL LIST

Material	Source	Price
Leader's Guide	Copy-Print Centers 1208 S. W. Jefferson Street Portland, Oregon 97201	$15.00 each
Participant Materials	Copy-Print Centers 1208 S. W. Jefferson Street Portland, Oregon 97201	2.50 each
Confrontation Tapes I, II, III, IV	Rex Recording Studios 931 S.W. King Street Portland, Oregon 97205	12.27 per set
Demonstration Equipment	School Teaching Aids and Supplies (STAS) 1225 Eighth Street Berkeley, California 94710	
Pulse Glass (Subset 1)		32.40 per dozen 3.00 each
Bi Metallic Strip (Subset 12)		12.96 per dozen 1.20 each
Glass Container (Subset 12)	Local	
Cloth (Subset 12)	Local	
Candle (Subset 12)	Local	
Rubber Sheeting (Subsets 12 & 15)		.35 sq. foot
Glass Cylinder (Subset 15)	Local	
Eye Dropper (Subset 15)		.48 per dozen .05 each
Tape Recorder and Empty Reels	Local	
Transparencies or Newsprint	Local Duplication	
Overhead Projector	Local (Optional with Transparencies)	
Name Tags	Local	
Letter/Labels	Local	
Paper and Pencils	Local	

SUBSET 1:
ORIENTATION

64 Minutes

NOTES TO LEADERS

Have everything ready to go for the first meeting. Keep loose, have fun and enjoy yourself and the participants.

LEADER PREPARATION

1. Newsprint or overhead transparency of workshop themes ready for display
2. Tape recorder ready with TAPE C-I
3. Pulse glass ready for demonstration
4. Name tags ready for distribution
5. PARTICIPANT MATERIALS

    1.1 Participant Notes
    1.2 Schedule of Workshop Activities
    1.3 Performance Goals
    1.4 Bibliography
    1.5 Glossary
    1.6 The Pulse Glass
    1.7 Classroom Interaction

SUBSET 1

RATIONALE	MINUTES	SCHEDULE
a) Participants need to have some information about workshop content so they won't spend a disproportionate amount of time wondering about it. However, a prolonged discussion of what is to take place would be futile at this point.	2	a) Pass out name tags and pens.
b)	10	b) Introduce THEMES OF WORKSHOP. Have themes in full view of participants.
c)	2	c) Pass out packet of written materials to each participant.

LEADER INPUT

a) My name is ________________; I'll be the workshop leader. Please write your name on the name tag. Pin your name tag on so we can get to know one another's name.

As workshop leader, I will see that certain materials are available, that the activity schedule is followed and that time limits are observed. You will be learning from the materials provided, from yourself and from your trio and small group members. This workshop provides ideas and activities for trying and testing concepts and for gaining skill in using them. The ideas have to do with Facilitating Inquiry in the Classroom. You will be deciding on their worth. YOU'LL FIND THE WORKSHOP DEFINITION OF INQUIRY EVOLVING AND GROWING AS WE PROGRESS THROUGH THE WORKSHOP.

b) The title of the workshop is "Facilitating Inquiry in the Classroom." One of the major themes of the workshop is to IDENTIFY, PRACTICE AND GAIN SKILL IN USING INTERACTION PATTERNS, those things the teacher does which:

1. ALLOW STUDENTS TO INQUIRE. We will be looking at the kinds of conditions which must exist if students are to inquire.
2. HELP STUDENTS GROW IN THEIR ABILITY TO LEARN INDEPENDENTLY. We will be looking at what the teacher does to have students become aware of inquiry processes.
3. REVEALS STUDENT ATTITUDES AND PERCEPTIONS OF INQUIRY PROCESSES. We will be tuning in to the students' own values of rational thought processes.

A second major theme is TO IDENTIFY WHAT STUDENTS DO WHEN THEY INQUIRE, HOW THEY GROW AS INQUIRERS AND TO DIAGNOSE AND EVALUATE WHERE INDIVIDUAL STUDENTS ARE ON A CONTINUUM OF INQUIRER GROWTH. We will be looking at the questions "How do you know an Inquirer when you see one?" and "How do you know if he is getting any better at it?"

The third major theme is TO TRY OUT, PRACTICE AND GAIN SKILL IN HELPING ONE ANOTHER LEARN. We will be examining communication and teamwork activities that make it possible for trios and groups of six to actually carry out and assess their own learning.

c) Here is a set of written materials you will use during the workshop. Take two minutes to read the cover sheet. You will need to bring this set of materials to each workshop meeting. (Time 2 minutes)

SUBSET 1

RATIONALE	MINUTES	SCHEDULE
d) A concrete example of inquiry and the workshop content is needed to help participants conceptualize. People are more at ease in forming trios when they have a common experience to talk about.	2	d) Show behavior of liquid in pulse glass. (After the demonstration, put the pulse glass out of view.)
e)	5	e) Refer to HANDOUT 1.6.
f)		f) Give directions for listening to TAPE C-I.
g)	2	g) Participants listen to Tape C-I.
h)	4	h) Give directions for forming trios.
i)	4	i) Trios form small groups.
j)	1	j) Refer to HANDOUT 1.7 and give directions for listening to tape.

LEADER INPUT

d) Here is a problem focus a teacher gave to a sixth grade class, "Why does the red liquid move?" (Demonstrate pulse glass for 2 minutes)

e) So that you know something about the pulse glass event itself, read over HANDOUT 1.6. We will be referring back to this event during the workshop. (Time 5 minutes)

f) Here are some responses from students in the sixth grade class as they tried to explain, "Why the red liquid moves." Listen to their responses, thinking how you might respond to each of them. This workshop is concerned with the interaction patterns, the things which the teacher says, that allow students to inquire and grow as inquirers.

g) Listen to TAPE C-I. (Approximately 2 minutes)

h) I am going to ask you to get up and walk around the room. Look at people, introduce yourself and get acquainted. Meet as many other persons as possible and then form into trios. The trios will remain together for the rest of the training and will practice team building skills. (Time 4 minutes)

i) Now that you are in trios, I am going to ask two trios to get together. Introduce yourself in the group of six. This group of six will be your Small Group for the rest of the training. [See Introduction to Leaders for suggestions in grouping odd numbers of trainees.] (Time 4 minutes)

j) HANDOUT 1.7 contains responses of the sixth grade students whom you heard on the tape. I am going to replay the tape. This time as you hear it, write down how you would respond to each student at Item A. You will not complete Items B and C while the tape is playing. However, after the last student response, complete Items B and C for all responses. For B, answer, "What do you think the student is doing?" and for C, "Why did you respond the way you did?" Here is Tape C-I again.

	RATIONALE	MINUTES	SCHEDULE
k)	Discussing their responses at this time provides a comfortable way for trio members to interact with one another. This entry into looking at teacher behavior permits all participants to respond intuitively and is nonthreatening.	15	k) Replay TAPE C-I.
l)		1	l) Give directions for trio members discussing why they responded as they did.
m)	A workshop leader needs data on the predisposition of participants to using tactical moves and to providing conditions for inquiry. This data helps him eliminate redundancy and/or confusion in workshop experiences for some participants. This tool provides some data which should be followed by individual interviews where prior experience with inquiry skills may be diagnosed.	15	m) Trio members share responses.
n)		1	n) Inform participants of future use of HANDOUT 1.7.

LEADER INPUT

k) (Tape, approximately 2 minutes) Allow 13 minutes to complete Items B and C on HANDOUT 1.7. (Time 13 minutes)

l) In your trios, discuss how you responded to the students, why you responded as you did and what you thought the student was doing. I'll give each trio member five minutes to tell the others what he has done and why.

m) Interrupt trios at five minute intervals to ask another trio member to say how he responded and why. (Time 15 minutes)

n) Your responses, the things you wrote on your paper, are what we referred to earlier as interaction skills. These interaction skills are the first theme of the workshop. We will be trying out and practicing interaction skills or ways of responding to students which allow them to inquire and which facilitate their growth as inquirers. We will come back to these student responses during the workshop to explore alternative ways of responding to students. Pass in your paper to me now. I will look them over and return them to you. You then can hold on to Handout 1.7 for future comparison.

These are the written materials you will be using in the workshop. In addition, you will be using some audiotapes, a tape recorder, a group of students and fellow trainees to help you learn. The written materials will be used in the order provided. As the workshop moves through the individual subsets, you will be given time to read and study each piece. If you find that you learn better by reading ahead, particularly the more lengthy sheets, this is fine. There will always be time provided, however, during the workshop for reading.

The workshop is designed so you learn piece by piece, subsequent learnings being based on what you are doing at the time. This design means:

1. It is important to learn a particular piece during the activity period provided
2. The participant is limited at any one time to the pieces learned; he shouldn't feel "this is all there is" until the end of the training period

The Schedule of Workshop Activities gives an idea of the workshop topics and the Performance Objectives denote specific workshop learnings.

Although performance objectives for the workshop are concerned with describing, identifying and classifying, primary learning is concerned with actually practicing and producing student-teacher interaction patterns which facilitate inquiry in the classroom. These interaction patterns are learned and practiced in three sections. Each set builds upon the other and provides the participant with an increasing range of responses.

Bring this set of materials to each of the workshop meetings.

SCHEDULE OF WORKSHOP ACTIVITIES

Handout 1.2

Registration	
Subset 1	Orientation
Subset 2	Experiencing Inquiry as an Inquirer
Subset 3	Identifying Possible Risks and Advantages
Subset 4	Allowing Inquiry to Happen
Subset 5	Inquirer Behavior
Subset 6	Practicing Allowing Inquiry Moves
Subset 7	Evaluating Teamwork Relationships
Subset 8	Developing Problem Focuses
Subset 9	Using Allowing Inquiry Moves
	PRACTICE SESSION WITH CHILDREN
Subset 10	Assessing First Practice Tape
Subset 11	Individual Trio Member Rating
Subset 12	Facilitating Growth Moves
Subset 13	Using Facilitating Growth Moves
	PRACTICE SESSION WITH CHILDREN
Subset 14	Assessing Second Practice Tape
Subset 15	Tuning In Moves
Subset 16	Using Tuning In Moves
	PRACTICE SESSION WITH CHILDREN
Subset 17	Assessing Third Practice Tape
	PRACTICE SESSION WITH CHILDREN
Subset 18	Assessing Fourth Practice Tape

PERFORMANCE GOALS

At the conclusion of an Inquiry Workshop, each participant will be able to accomplish the following goals.

1. Use speaking skills in trios, small groups
2. Use listening skills in trios, small groups
3. Use speaking skills in unstructured situations (on own)
4. Use listening skills in unstructured situations (on own)
5. Name tactical moves which allow inquiry and state the intent of each
6. Identify tactical moves which allow inquiry from enactments or tape recordings
7. Use only those tactical moves which allow inquiry while interacting with a group of inquirers
8. Develop four problem focuses that meet the stated criteria
9. Identify general inquirer actions (evolving ideas, generating data)
10. Judge if a problem focus meets stated criteria
11. Name the seven inquirer actions and subject of actions
12. Label examples of inquirer actions and subject of actions
13. Identify inquirer actions when observing student-teacher interaction
14. Use tactical moves allowing inquiry in response to inquirer actions from a problem presented to them
15. Name those tactical moves which facilitate growth and state the intent of each
16. Identify tactical moves facilitating growth from enactments or tape recordings
17. Use tactical moves facilitating growth with students so they indicate an awareness of the inquiry process
18. Identify student actions which indicate awareness of inquiry process
19. Name the tactical moves which allow awareness and state the intent of each
20. Have the students share their perceptions and attitudes about the inquiry process by using his problem focus and drawing from the full range of tactical moves
21. Identify when students share perceptions and attitudes about the inquiry process
22. Identify when a teacher is using those tactical moves which foster awareness

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GLOSSARY

Handout 1.5

1. ASSESSING	Listening to another participant's tape recording and reporting on perceived behaviors. Purpose: To help the participant know clearly what he is and is not doing.
2. AUTONOMY	Making decisions for the self about what to do, when to do it and how to do it when attempting to develop ideas and understanding. Purpose: To use the self as a resource.
3. ENACTING	Taking the role of leader or inquirer within the workshop learning group. Purpose: To try different behaviors under safe, supportive conditions.
4. INQUIRER	One who "messes" with some concrete object or event, checking to see if his ideas about the object or event are consistent with what is observable or verifiable. Purpose: To learn from one's own experience.
5. INQUIRER ACTION	A verbal response of the student asking for information or telling about his idea. Purpose: To share one's idea and informational need with others.
6. INQUIRER AWARENESS	A student talking about what he is doing and why he is doing it. Purpose: To know how to learn from one's own experience.
7. INQUIRER GROWTH	Movement through developmental stages from having to be told what is right to his own decision on what is right. Purpose: To become more in control of one's own means for knowledge and learning.

8.	INQUIRY	"Messing around" with some concrete object or event, checking to see if one's ideas about it are consistent with what is observable and verifiable. Purpose: To produce personal ideas and understanding as contrasted to consuming the ideas and understandings of others.
9.	PRACTICING	Taking the role of a leader in an actual classroom. Purpose: To allow the workshop participant to try different behaviors in a natural instructional setting.
10.	PROBLEM FOCUS	A concrete event or object presented as a topic of inquiry. Purpose: To stimulate student response and action.
11.	TACTICAL MOVE	A question or statement by the teacher to a student, used at the right place and at the right time. Purpose: To maximize student autonomy.
12.	TEAMWORK SKILL	The ability of a workshop participant to use listening and saying skills to communicate openly and honestly his perceptions of common group experiences. Purpose: To say or do something which helps another participant learn the workshop content.

I. MEANS BY WHICH FOCUS IS CREATED

A. Demonstration

The pulse glass consists of two small globes connected by a glass tube. It is partially filled with a red liquid. The teacher should hold it by the middle of the connecting tube with the globes upward. When he places one hand over the right bulb, the red liquid will begin to bubble and move to the other side. As he holds it, the liquid will continue to bubble slowly, and the bubbles will move from the right surface in the tube to the top of the liquid in the globe. The red liquid will move to the other side of the glass, bubbling as it did before, when he places his hand on the left-hand bulb.

B. Focusing Question

Why does the red liquid move?

II. PROBLEM ANALYSIS

A. Consequential Variables

1. The pulse glass system must be air tight, a closed system.
2. Most of the air must be pumped out of the system and then sealed. (The little tip is where it was sealed after the air was pumped out.)
3. The liquid used in the pulse glass must be one that has a low vaporization point.

B. Attendant Data

1. The pulse glass is an airtight system.
2. The pulse glass is rigid and in this sense cannot be "squeezed in."
3. There is very little air in the pulse glass.
4. Methylene chloride is the name of the red liquid. It is a colorless organic liquid; red dye has been added to make it more visible.
5. The boiling point of methylene chloride is 40.1 degrees Centigrade. The human body temperature is approximately 37 degrees Centigrade.
6. Methylene chloride is slightly more dense than water.

B. Attendant Data (Continued)

7. Methylene chloride is not repelled by heat or the human body. It will not move away from a hand or from a hot or cold source placed near it.

8. A high vapor pressure is built up inside the pulse glass when heat or cold is applied to one of the bulbs.

9. If the pulse glass was upside down, the fluid would not flow from one side to the other when heat or cold was applied. Eventually, however, the liquid would evaporate from the warm bulb and condense in the cold bulb.

C. Scientific Principles

1. Newton's First Law of Motion
2. Displacement
3. Transmission of Heat
4. Vapor Pressure
5. Gases
6. Changes of State

III. PRECAUTIONS

A. The students may become preoccupied with trying to guess the name of the liquid. In that case, tell them. While names are useful as labels, the students should analyze the events, properties and conditions of the situation.

B. The pulse glass is somewhat fragile and care should be used in experimenting with it. Although you may wish to illustrate the answers to some students' questions, it should not be exposed to the extreme heat of a flame or to freezing temperatures. It should not be placed in or near the mouth.

Name ______________________________ Date ______________________________

Answer Item A for each response while the tape is running:

A. How would you respond to the student?

After the tape is finished, study each response and decide:

B. What action is the student taking toward solving the problem?

C. Why did you respond the way you did to each student?

1. Does the red stuff in the tube move because of light?

   A.

   B.

   C.

2. I think that red stuff in there is like carbonated water. When you shook the glass, the liquid let off a gas, like when you shake a pop bottle. The gas makes pressure and pushes the liquid over.

   A.

   B.

   C.

3. If the liquid was, oh, like 20 degrees hotter, would it still work?

   A.

   B.

   C.

4. I'm not sure, but I think heat makes it move, but I need to know if you put something cold on it, that wasn't warm at all, would it still work?

   A.

   B.

   C.

5. Could a fly live in the top of one of those little balls?

A.

B.

C.

6. Why does it bubble like that?

A.

B.

C.

7. Well, liquid boils at different degrees.

A.

B.

C.

8. If I wanted to know if cold would make it go, we could do the experiment by putting ice on it, to see if it would move...work.

A.

B.

C.

9. Well, were those bubbles, when you held it up, when it went into the arch, were those air bubbles, when it went up to the other red, to the gas...glass ball?

A.

B.

C.

10. It kind of looks like a thermometer.

A.

B.

C.

11. Well, for a while there, I thought it worked because of heat. Now I'm not sure because it also moves when something cold is on there.

    A.

    B.

    C.

SUBSET 2:
EXPERIENCING INQUIRY AS AN INQUIRER

96 Minutes

NOTES TO LEADERS

Be sure the trios are spread out enough so they do not interfere with each other. They should be close enough, however, to hear your directions easily. Trio directions are critical in this subset.

Background information for leaders on TAPE C-II has been included on pages 35-38. Read it before this subset begins.

If for some reason you feel participants will not be able to hear Tape C-II clearly, you may wish to refer them to the typescript, Handout 4.2, to read while the tape is playing.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 2
2. Tape recorder ready with TAPE C-II
3. Paper and pencils
4. PARTICIPANT MATERIALS
    - 2.1 Repeat Before You Talk
    - 2.2 Round I: Listening, Saying
    - 2.3 Round II: Listening, Saying
    - 2.4 Round III: Listening, Saying

SUBSET 2

	RATIONALE	MINUTES		SCHEDULE
a)		3	a)	Introduce Subset 2. Show SCHEDULE OF ACTIVITIES
b)	There needs to be a problem focus for the participants if inquiry is to take place productively. Tape C-II serves as a problem focus and is used as a referent for relating subsequent workshop learning. There needs to be a common referent to which learning can be related and evaluated when self-assessment tools are being used for assessment and evaluation.	10	b)	Play TAPE C-II
c)	Participants need to experience the processes of inquiry directly as inquirers, if they are to understand and develop the skills necessary to facilitate inquiry in the classroom. This particular problem focus is relevant to them both as teachers and as workshop learners.	25	c)	Arrange participants into semicircle around instructor for inquiry activity.
d)	The participant now writing down his own perceptions and conceptions will have a referent for later evaluation of his own perceptual and conceptual growth. This statement also serves as a basis for the team building exercise which follows.	5	d)	Instruct participants to write a statement on "Why does the teacher respond the way he does?"

LEADER INPUT

a) For this subset you will have an opportunity to inquire and develop your own ideas about why a teacher is responding the way he is. You will hear the teacher responding on a tape recording. You will also have a chance to clarify your own idea so that it communicates what you intended. You will be working to develop skill in helping one another communicate clearly.

b) This is a tape recording of another group of sixth grade students working on the same pulse glass problem. There were seven students in this group from the West Sylvan School, Portland, Oregon. Although it was not anticipated that the students had been involved previously as we planned to involve them, it so happened they had had a similar experience, in fact, with the same problem event. This tape is the first 10 minutes of an hour session; the tape has not been edited or cut. Students had an opportunity to handle the pulse glass during the experience. Ben Strasser, the teacher, has had considerable experience facilitating student inquiry. The tape was made in a small studio at the Northwest Regional Educational Laboratory. (Time 10 minutes)

c) Now you will have a chance to inquire into "Why does the teacher on the tape respond the way he does?" If you have some ideas, you are free to share them. If you feel you need some information about the teacher, the activity or the kids, you can ask. Just raise your hand if you want to talk. When you're through talking, say "I pass." It is not my role to judge your ideas about why he is responding the way he is. It's your role to judge your own idea. If you want to talk with one another about the problem focus, let me know and I'll give you two minutes for a conference.

OK, "Why does the teacher on the tape respond the way he does?" (Time 25 minutes)

d) Now that you have had a chance to share your ideas and to gather some data, write a statement on "Why the teacher on the tape responds the way he does." Include in your statement the intent or purpose of the teacher. KEEP YOUR STATEMENT AS CONCISE AS POSSIBLE. (Time 5 minutes)

SUBSET 2

RATIONALE	MINUTES	SCHEDULE
e)	4	e) Refer to HANDOUT 2.1.
f) Participants need an opportunity to practice listening and talking skills so at a later time they can give open and honest feedback to one another.	4	f) Demonstrate Repeat Before You Talk exercise using participants.
g)	6	g) Trios to do Repeat Before You Talk exercise.
h) Participants generally don't hear directions the first time.		h) Interrupt after 2 minutes to give the instructions again.
i)	1	i) Give input to explain exercise on listening-saying skills and refer to HANDOUTS 2.2, 2.3, 2.4.

LEADER INPUT

e) You will be reading your statement to members of your trio in a few minutes. However, first, we will practice a few listening and speaking skills. You will use HANDOUT 2.1 in the next exercise. The exercise is called Repeat Before You Talk. Each trio should quickly select a topic that is controversal and of interest to its members. One member starts by sharing an idea or opinion about the topic. He is the speaker. A second person, the listener, must first repeat what he hears and then ask if he has heard correctly. Then if he wishes, the listener may ask for illustrations or a definition of terms. The third person will observe to see that these procedures are followed and report his observations to the listener. Notice that these procedures for the listener are found on Handout 2.1. Take a minute to look at Handout 2.1. (Time 1 minute)

f) Before we begin, let me illustrate how the activity works. Let's take the topic, "Schools should be organized so that students attend 12 months each year." Now, one of you will be speaker and share your reaction to this topic. I will be the listener and follow the procedures I've just read. Will you, (another trainee) be the observer and tell me if I have followed the procedures on Handout 2.1? [Leader listens, repeats, asks if he has heard correctly, asks for clarity or definition.]

g) Select your topic in your trios. Have one person begin as speaker with the other two serving as listener and observer. After the first speaker finishes, the listener responds and the observer reports, rotate around so someone else is speaker, listener and observer. Repeat the exercise and rotate one more time. Everyone should get to be speaker, listener and observer. You will have six minutes for this triple rotation. (Time 6 minutes)

h) Remember, the listener must first repeat what the speaker has said before he asks for clarity, definitions or before he comments.

i) Now, let's go back to the statements we wrote on "Why the teacher on the tape responds the way he does." THE TASK HERE WILL BE TO HELP ONE ANOTHER CLARIFY HIS STATEMENT SO THAT WHAT IS INTENDED IS BEING CLEARLY COMMUNICATED. We will expand our Repeat Before You Talk exercise to include other listening and saying skills. To help practice these skills you will use HANDOUTS 2.2, 2.3, 2.4.

SUBSET 2

RATIONALE	MINUTES	SCHEDULE
j)	5	j) Give directions for exercise.
k)	11	k) First round of trio exercise. Stop trios after 8 minutes and ask observers to report.
l)	11	l) Begin second round trio exercise. Stop after 8 minutes for observers to report.

LEADER INPUT

j) You will be working in your trios for this exercise. There will be three rounds. For each round there will be a speaker, a listener and an observer. To begin, one member of the trio will be the SPEAKER and read or say his statement. He will be trying to follow those behaviors on HANDOUT 2.2. Take a look at this guide sheet.

While the speaker shares his statement, another member of the trio will be the LISTENER and use HANDOUT 2.3. He will be attempting to follow the behaviors on this sheet. Take a look at Handout 2.3.

The third member of the trio, OBSERVER, for the first round will be using Handout 2.2 observing the behavior of the speaker. After 8 minutes has been allowed for the speaker to get help in clarifying his statement, the observer will have 3 minutes to report to the speaker. Then for the second round, another member of the group will be the speaker and read his statement. A second member will serve as listener. The third member will be the observer. During this round, the observer uses Handout 2.3 which is intended to record listener behavior. Again, for this round there will be 8 minutes for clarity of a statement and 3 minutes to report.

For the third round the tasks of trio members shift again so each member will have a chance to work as a speaker, listener and observer. For this round the observer will use HANDOUT 2.4 which asks for inferences about the degree to which speaker and listener work together. Take a minute to look at Handout 2.4. For the third round, there will be 8 minutes for clarifying a statement and 3 minutes for reporting.

I will start and stop you for each of the rounds and indicate when observers report. Select members for the first round. Begin with the speaker reading or saying his statement. Remember, you are working together to get a clear statement, and for the first round, observers will be using Handout 2.2. (Time 8 minutes)

k) [After 8 minutes] Stop.
Will the observer for Round I report from Handout 2.2? (Time 3 minutes)

l) Rotate tasks among group members for the second round. Observers for this round will be observing the listener and using Handout 2.3. Remember you are working together to get a clear statement.

[After 8 minutes] Stop.
Will the observer for the second round report using Handout 2.3? (Time 3 minutes)

SUBSET 2

RATIONALE	MINUTES	SCHEDULE
m)	11	m) Begin third round of exercise. Stop after 8 minutes for observers to report.

LEADER INPUT

m) Rotate tasks among group members for the third round. Observers for this round will observe both the speaker and the listener by using Handout 2.4. Remember, you are working together to get a clear statement.

[After 8 minutes] Stop.

Will the observer report from Handout 2.4? Notice the observer is asked to share the basis for his inferences as well as his inferences. (Time 3 minutes)

BACKGROUND INFORMATION FOR CONFRONTATION TAPE II

SUBSET 2

Interviewer: What were you specifically trying to do with these kids today?

Teacher: What was my intent?

Int.: Yes.

Teacher: I guess there were a couple. The first one was just to give them some experience with the strategy, you know. I guess in this situation it's kind of different from what usually happens in the classroom. So you have to give them a chance to feel out expectations and what their role is as well as what my role is. I guess more important than that though, is I'm kind of concerned about setting up some kind of dilemma for them in the sense of, "What do you do with an idea when someone isn't going to evaluate it for you?" I think that's a critical issue, although I don't think they were aware of this, but they were living with it. I read it on some of their faces.

Int.: In what way?

Teacher: Well, when they would say, "Well, I think that maybe it happens because heat has something to do with it," or "This causes it." I would respond by saying, "Well, maybe it could be," and I could see by their faces that they were saying, "All right, but then how do I find out if it could be?" Only in one case did I detect where someone really took an issue--a boy who was sitting where you are now, next to Charles, Mike, came up with an idea. I responded to him in more or less the same way, accepting but not valuing, not judging the quality of it and he came back and tested the idea. One boy said....

Int.: Tom.

Teacher: Tom, "Will it work with the match?" When he found out it would, he said, "Now I've tested the pulse idea and I don't have to worry about that one any more." So another kind of thing that I'm looking for in the kids is to get some data about them, about how they function, about how they deal with their own ideas.

Int.: And this was what you were trying to do in this session?

Teacher: Yes.

Background Information, Tape C-II

Interviewer: How do you feel about the session, you know, the whole session in general?

Teacher: I felt real good about it. I was concerned about how they were going to act when I didn't give them some process support as they came up with theories. But you have to let them begin dealing with the question, "Well, how do I test my idea?" before you jump in and start...before you try to answer a question they haven't asked.

Int.: Do you think they would have done this if you had given them any....

Teacher: I don't know. I think I could have intervened with some process support moves with some of the kids. I think it may have had a local effect, but I don't know what long-range effect it would have had until they get more of a chance to build a need for it.

Int.: I'm not sure what you mean by process support. Could you give me an example?

Teacher: Well, yes, for example, in several cases they came up with theories and I just accepted them. In many cases I was saying, "Well, it could be," and that was it. I had no evidence of any logical tie-up between the theories in one sense and some way to test it. I could have intervened by saying, "Well, you could experiment to test that idea." That's kind of a process support move. Or, at the lowest level, I could have even designed an experiment for a student. For example, I could have intervened on Mike and said, "Well, you can test your pulse idea by trying it with another kind of heat," and that would have been a process support intervention.

Int.: Then you're saying there are some things you could have done this time, that you didn't do?

Teacher: Well, I didn't do it because I was working to allow them to deal with it on their own first.

Int.: What do you think was the effect on the kids.... I thought you said a while ago you saw some signs on their faces, some feelings they had.

Teacher: I read it as kind of neutral. Maybe...I'm kind of reading how I would feel in the same situation. I don't know how much that gets in the way, but I think they get more of a positive feeling when they see themselves able to test ideas more systematically. In a way, I kind of bank on the newness of the strategy to carry them through some of these first neutral experiences. You know that

Teacher: says I need a way to deal with this. I don't know how to test my ideas and, instead, depend on the newness of the strategy to carry them past that point. You can come back to something once or twice, but a third time, hopefully, they'll be ready for some of the process support moves that will help them begin to see some increase in the power they are beginning to develop.

Interviewer: I think that's kind of what I was after. Do you feel the kids were comfortable with the amount of assistance you gave them?

Teacher: I guess in a way I was trying to make them uncomfortable.

Int.: Did you have any evidence that they were?

Teacher: I mean uncomfortable when it came to my not judging ideas. You know, comfortable when it came to asking me questions, "Is that water?" or "Is that gas?" but when it came to asking me, "Is my idea right?" they really didn't get anything out of me.

Int.: What would you do differently next time?

Teacher: I would behave pretty much the same way, I think.

Int.: Now, thinking of tomorrow, are you going to do this same type of thing?

Teacher: Except for one thing I may do differently. One boy found a way to test a theory. I may ask him about it to see if he can remember what happened, and in a sense, to hold it up in front of the group.

Int.: Will you point out this strategy at all or will you expect the rest of the students to use it as a model?

Teacher: I'll watch to see if they do. I'll try to let him respond if he can and let it go at that level to see what effect that has on the way he behaves and others behave, to see if it has any effect. I don't know, this group surprised me with the way that they operated. Generally, they were doing experiment questions, they were verifying intuitively. I'd want to give them a little more chance to grow. That's why I said I wouldn't essentially change my behavior other than perhaps asking the question, "How did you test that idea?"

Interviewer: Is this usually the first step--testing ideas?

Teacher: Yes, it's the first word they are confronted with, and that's what it was all about today. I wasn't responding to ideas other than just accepting. That's why I think if there is any kind of tension or anxiety, it's in that realm of testing ideas.

REPEAT BEFORE YOU TALK

Handout 2.1

This exercise will be used three times. Each participant should play each of the three roles: speaker, listener, observer. First, the group should select a controversial topic of interest to its members. The entire cycle of three rounds should take approximately 6 minutes.

SPEAKER: After the group chooses a topic, the speaker in this exercise will quickly share his ideas or opinions concerning it.

LISTENER: After the speaker has finished, the listener will restate in his own words what he has heard the speaker say. Then, if he wishes, the listener may ask for more details, examples or definitions of words being used by the speaker.

OBSERVER: While the others in the trio are busy in this conversation, the observer will be watching the listener. The observer should check to see if the listener:

1. Restates what he has heard the speaker say
2. Asks if it has been restated correctly
3. Asks the speaker for examples or definitions

Following each round of the exercise, he will report his observations to the listener.

ROUND I:
LISTENING, SAYING

Handout 2.2

SPEAKER: Using your written statement as a guide, explain to the others in your trio why the teacher on the tape responds as he does. Use the actions in the chart below to help you.

LISTENER: During Round I, the observer is watching the speaker. However, the listener should be attentive and practice the listening skills shown in the chart on the next page, Handout 2.3.

OBSERVER: As the speaker is talking, watch for the following behaviors. If and when they occur in his conversation, place a tally mark in the box accompanying them in the chart. Report your observations to the SPEAKER at the end of this round.

1. Clarify something in the statement	
2. Ask the listener to indicate what he has heard	
3. Give an illustration of something said in the statement	
4. Define a word used in the statement	

Rotate roles at the end of this round.

ROUND II:
LISTENING, SAYING

Handout 2.3

SPEAKER: Using your written statement as a guide, explain to the others in your trio why the teacher on the tape responds as he does. In this round, the observer is watching the listener. The speaker, however, should practice the skills listed on the previous page, Handout 2.2.

LISTENER: During this round the listener should practice those skills listed below on the chart.

OBSERVER: Watch the listener while the speaker is talking. As he attempts to understand what the speaker is saying, make a tally mark beside those actions below which you observe in his behavior. When the speaker is finished, report your observations to the LISTENER.

1. Restate what he has heard	
2. Ask if he has repeated accurately	
3. Ask the speaker to repeat something he has said in his statement	
4. Ask the speaker to give an illustration of something said in his statement	
5. Ask the speaker to define a word he has used in his statement	

Rotate roles at the end of this round.

Handout 2.4

ROUND III:
LISTENING, SAYING

Both the SPEAKER and the LISTENER in Round III will be practicing to facilitate understanding (Items 1, 3, 5, 7, 9) and to eliminate behavior which produces misunderstandings (Items 2, 4, 6, 8, 10).

The OBSERVER will be watching both people for behaviors which foster clear communication. As the conversation continues, the observer should make a tally mark below beside those statements which reflect the behaviors as he sees them of either the speaker or the listener. At the end of this exercise, those results should be reported to the SPEAKER and the LISTENER. The observer should try to include some examples of the behavior which formed the bases for his inferences.

	Speaker	Listener
1. Each is listening to the other		
2. At least one is not listening		
3. Each checks for understanding		
4. Only one or neither person checks for understanding		
5. Each follows the other so a question or statement is not left hanging		
6. One leaves another's question or statement hanging		
7. Each appears interested in what is being said		
8. One or neither appears interested in what is being said		
9. They are doing a good job in clarifying the statements being shared		
10. They are doing a poor job in clarifying the statements being shared		

SUBSET 3:
IDENTIFYING POSSIBLE RISKS AND ADVANTAGES

66 Minutes

NOTES TO LEADERS

When reproducing the risk and/or advantage statements on a chart or overhead transparency, paraphrase them in short phrases. Then, when you review them with participants at the next meeting, ask if your paraphrasing was correct. This will allow them to see if, in fact, each of their statements was clear.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 3
2. Paper and pencils
3. PARTICIPANT MATERIALS
    - 3.1 Facilitating Inquiry in the Classroom
    - 3.2 Round I: Helping Someone Say What He Means
    - 3.3 Round II: Helping Someone Say What He Means
    - 3.4 Round III: Helping Someone Say What He Means

SUBSET 3

RATIONALE	MINUTES	SCHEDULE
a) By this time, participants will understand a more formal explanation of what inquiry is and the nature of the workshop. This formal explanation will serve as a referent in the task to follow.	3	a) Introduce Subset 3. show SCHEDULE OF ACTIVITIES.
b)	10	b) Ask the participants to read HANDOUT 3.1
c) Some participants are fearful of making changes to allow inquiry in their classes. These fears can be reduced if they are expressed and examined openly in the group. Fears are not in opposition to inquiry. If not allowed expression, they frequently appear during the workshop as hostile, stubborn, negative arguments or excuses. They tend to reflect imagined goals of those who want changes to allow inquiry. When participants identify risks in allowing inquiry, they are frequently expressing these fears.[1]	5	c) Pass out blank paper. Ask participants to write those risks (chances of losing something) and/or advantages (something to be gained) involved in allowing inquiry in the classroom.
d)	5	d) Give directions for using HANDOUTS 3.2, 3.3 and 3.4

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[1] For more information see:

Maier, Norman R.F. Principles of Human Relations. New York: John Wiley, 1952. Chapter 3, pages 62-73.

LEADER INPUT

a) In this subset you will be identifying the risks and/or advantages of allowing inquiry in the classroom. You will be sharing these in your trios and helping one another to get a clear statement. You will be working (1) to get a statement that communicates what is intended (2) to help another person get a clear statement. (Time 3 minutes)

b) HANDOUT 3.1 is a statement about the workshop and what is and is not meant by the workshop definition of inquiry. On the last page some key distinctions have been underlined to emphasize the conditions when inquiry is taking place in the classroom. Take 6 minutes to read the pages and underline your own distinctions. (Time 10 minutes)

c) If a teacher practices facilitating inquiry in the classroom, what are some of the risks or consequences that would result over the use of other practices? Even though facilitating inquiry may have a potential value, there is a price one has to pay to obtain such values. In deciding to make any changes in the classroom, there are favorable and unfavorable aspects. It is important to examine unfavorable aspects carefully so as not to be misled. What do you see as possible risks if teachers are to practice facilitating inquiry in the classroom? Where you perceive inquiry as having potential value in the classroom, what are some of the advantages? On the blank sheet handed you, write down whatever risks and/or advantages you perceive in relation to allowing inquiry in the classroom. (Time 5 minutes)

d) For the next exercise, you will be working in trios to help one another get clear risk and/or advantage statements. THE INTENT OF THE EXERCISE IS NOT TO ARGUE THE MERITS OF THE STATEMENT BUT TO UNDERSTAND IT AND CLARIFY IT. There are three rounds to the exercise; during each round you will be using HANDOUTS 3.2, 3.3 and 3.4.

Directions for Round I are found on Handout 3.2. You will notice that one member of the trio serves as speaker. He reads his statement and LETS THE LISTENER KNOW HOW HE WANTS TO BE HELPED TO SEE THAT HE HAS A CLEAR STATEMENT. A second member of the trio serves as listener. He listens to the speaker's statement and the kind of help being requested. Following the items on Handout 3.3, he helps the speaker get a clear statement. The third member of the trio is observer. For the first round, he observes the speaker. The observer follows the items on Handout 3.2 and reports his observations to the speaker following the conversation between speaker and listener.

SUBSET 3

RATIONALE	MINUTES	SCHEDULE
d)		d) Continued
e) Trio members can help one another clarify their risk statements so the "real" issue of the risk is revealed.	2	e) Ask participants to form trios.
f)	3	f) Give directions for clarifying a statement.
g)	6	g) Start first round.
h)	4	h) Ask observer to report.
i)	6	i) Start second round.

LEADER INPUT

d) Directions for Round II are found on Handout 3.3 and those for Round III are on Handout 3.4. In each round the positions of speaker, listener and observer should change. Each trio member should perform each task during the exercise. Take a few minutes to read each of these guides. (Time 3 minutes)

e) Take two minutes to get into your trios and select a speaker, listener and observer for the first round. (Time 2 minutes)

f) In each of the rounds there will be 6 minutes for the speaker and listener to work toward a clear statement. The speaker should select those statements that he wants to be perfectly clear about. Since the speaker will be handing in his statement, he will be trying to get a statement that communicates the same thing to everyone in the room. For instance, here is a risk statement and a request for help that a speaker started with: "Tell me what you think I mean by this statement: 'Allowing inquiry in the classroom would take too much time.'" After getting help in the trio the statement was changed to: "Allowing inquiry in the classroom would mean that I could not ask kids to read all of the chapter in the social studies book."

Here, the listener helped the speaker to clarify what the specific risk was. After this clarification, everyone could understand what he meant.

The observer will have 4 minutes to report on what took place between the speaker and listener.

g) I will start and stop you for each of the rounds. YOU ARE FOLLOWING THE DIRECTIONS ON HANDOUT 3.2 FOR THIS FIRST ROUND. OK, begin. (Time 6 minutes)

h) The observer should report now to the speaker from Handout 3.2. (Time 4 minutes)

i) For the second round you will shift tasks. Directions for this round are on Handout 3.3. NOTICE THIS TIME THE OBSERVER WILL BE WATCHING THE LISTENER. OK, begin. (Time 6 minutes)

SUBSET 3

RATIONALE	MINUTES	SCHEDULE
j)	4	j) Ask second round observer to report.
k)	6	k) Start third round.
l)	4	l) Ask third round observer to report.
m)	6	m) Ask participants to rewrite statements.
n) If the instructor is to avoid having the minority become stubborn in their attitude, he must take care to support the plausibility of a risk in the face of opposition by the majority.	2	n) Collect statements. Explain their use.

LEADER INPUT

j) The observer should report now to the listener from Handout 3.3, letting the listener know the specific behavior observed. (Time 4 minutes)

k) For the third round, shift tasks again so each trio member will have assumed all three tasks. Directions for this round are found on Handout 3.4. NOTICE THE OBSERVER WILL BE WATCHING BOTH SPEAKER AND LISTENER. Start round three. (Time 6 minutes)

l) The observer should report now to BOTH the listener and the speaker from Handout 3.4. (Time 4 minutes)

m) You have all had a chance to clarify your risk and/or advantage statements. Now each of you should rewrite your statement to say better what you intend. Indicate whether it is a risk or advantage statement. (Time 6 minutes)

n) Please hand in your rewritten statements. I will place them on charts. One chart will contain risk statements, the other chart advantage statements. We will be looking at the risk statements periodically during the workshop to see if they continue to exist or if, in fact, some of them are being reduced because of what is happening in the workshop. If it is agreed by everyone that an identified risk really doesn't exist, then it will be removed from the chart. If, however, one person believes the risk still exists, it will remain on the list. Only when everyone agrees to remove a risk will it be removed.

We will do the same with advantage statements. If it appears to everyone that an identified advantage does not really exist, then it will be removed from the chart. If, however, one person believes the advantage still exists, it will remain on the list. Everyone will have an opportunity to decide for himself on the risks and advantages of facilitating inquiry in the classroom.

[See Background Information for Risk and Advantage Statements, page 50.]

BACKGROUND INFORMATION FOR RISK AND ADVANTAGE STATEMENTS

In Subset 3, participants have an opportunity to identify both risks and advantages in allowing inquiry. Periodically during the workshop, this list of risks and advantages will be examined by workshop participants.

The effect of producing a list of risks tends to clarify individual attitudes toward inquiry and serves to reduce hostility and fear toward change. As the risks and advantages are examined at intervals during the workshop, risks are gradually eliminated by the participants themselves. Social pressure operates in the group so the leader may have to protect minority individuals who still have fears. Group values support the idea of inquiry so that the leader is not in the position of having to defend the program.

When reviewing the risk and advantage statements on the charts, the leader should simply ask if anyone feels a risk or advantage should be eliminated or added. If someone suggests an elimination, a simple vote should be taken. Too much free discussion on a risk may create intense social pressure and produce stubbornness in those hesitant about removing a risk. If everyone votes to remove it, it should be stricken from the chart. However, if one person feels a risk is still real and should remain, then it must stay. The same would be true if someone wants to remove an advantage statement.

Anytime someone wants to add a risk or advantage, the statement should go up on the chart without too much free discussion. That is, if someone wants a new risk added and another participant disagrees, there should be a short discussion. If the originator of the new risk still feels it is valid, it should be added to the chart without further comment. This activity, however, usually finds the risks disappearing as a result of new insight and perceptions.

What Is It for Students to Inquire?

When students inquire they use a rational process for building and testing their own ideas about the world. This is different from having someone else give them ideas about the world. When students grow as inquirers, it means they are more aware of what they are doing as they go about producing personal knowledge. This is different from having students dependent upon the teacher to give them knowledge.

When students use a rational process to build and test ideas about the world, they are matching a generalization or judgment (theory) they've made, against evidence (data) they've collected. They decide on their own match. This is different from giving students generalizations. It is also different from telling students their idea is wrong, or right, for that matter.

The process that inquiring students use is often called "scientific." This means that evidence is valued as the basis for generalizing or judging. It also means that ideas are shared publicly. Students inquiring spend time verbally building and sharing ideas with one another and with the teacher.

What Is It for the Teacher to Facilitate Inquiry in the Classroom?

What the teacher does to facilitate inquiry in the classroom is different from instructing students in "how to think." In fact, facilitating inquiry takes very little instructing. To be sure, the teacher must know the process that students are using. But the teacher is not set on teaching the process. Rather, the teacher tries to make it possible for students to use the process. We call this "establishing the conditions." The teacher establishes the conditions so students are free to inquire.

But the teacher's role is more. Students will inquire if the conditions are right. And when they do the teacher helps them know what they are doing. He helps them be aware of what they do, how they do it and the results. He increases the student's ability and will to decide alone. With new awareness and confidence, the student decides if the process has worth. Students decide how best to use it.

So the teacher's role, too, is to know where students are, how they think, what they think, how they feel, what they perceive. Students who feel free to talk, who know how to do things and who know what they do, share things about themselves. They also answer a teacher's probe frankly, honestly. So the teacher asks questions that keep him in touch with students. He knows when and how to ask such questions.

What Is the Workshop?

This workshop is planned so teachers learn how to establish classroom conditions which allow inquiry. Teachers learn how to help students grow as self-directed learners. Teachers learn how to tune in to the thinking and actions of students.

Teachers learn specific skills. Most of these are verbal interaction skills, ways of talking with and responding to students. It is believed that students' inquiry behavior can be facilitated through the verbal behavior of the teacher. Once more, "talk" makes it possible for thoughts to be exposed and shared.

At the end of this 50-hour workshop, teachers will be able to:

1. Classify inquirer behavior accurately
2. Establish conditions for inquiry through the use of tactical moves
3. Help students become more independent (called autonomy in the workshop)
4. Tune in to the thoughts, feelings and actions of students

Teachers show they can do these things by making tape recordings of their practice efforts; they learn to measure their own efforts.

Why Allow Inquiry in the Classroom?

This workshop has been organized around the original work of Dr. J. Richard Suchman. Teacher tactical moves come from the work of Ben B. Strasser. Dr. Suchman has spoken to the question, "Why facilitate inquiry in the classroom?"

> Perhaps we should ask the question: "Why not inquiry?" (Or, "Why don't adults inquire more than they do?") Inquiry is the search for meaning, for better ways to order and explain one's universe. When we are very young, all of the world we want to know is right before us at our fingertips. We come to know it by reaching out and touching it. The knowledge we gain may be egocentric, but it has come to us through our own fingers and eyes. We know what we know and how we know. Our knowledge is personal and clear.
>
> We are soon taught that we are expected to know more than what is in the immediate world. Our knowledge must extend beyond our own life space and must include ideas and conclusions we have not had a hand in creating. We say to

our children: "You must know and understand this. These are the meanings you will need to get along. Here is how you can get them...you will do as I say." Thus, we make the learner dependent by creating an artificial need to know, and a vicarious way of coming to know. When all of education becomes this, inquiry is bypassed.

When inquiry is forgotten, the attitudes, values and skills that accompany it also diminish. It becomes irrelevant to education. The system leaves no time or space for it. It becomes a lost response.

[This program in] inquiry development is an effort to reawaken the inquiring responses of children.[1]

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[1] Suchman, J. Richard. "Foreword," Inquiry Development Extension Service. by Costa, Lavaroni and Newton. Chicago: Science Research Associates, © October 1967, page vii. Reproduced by permission of the publisher.

FACILITATING INQUIRY IN THE CLASSROOM

Handout 3.1

FACILITATING INQUIRY IN THE CLASSROOM IS:	FACILITATING INQUIRY IN THE CLASSROOM IS NOT:
1. Allowing students to use and evaluate a rational process for building ideas and making judgments	1. Another method for covering content
2. Providing the means for students to gather the necessary information to build their ideas	2. Conducting a question and answer game
3. Establishing conditions which maximize decision making and decision assessment opportunities	3. Everyone doing what he wants to do
4. Allowing students to do for themselves	4. Something the teacher does to students
5. Allowing students to explore how explanations come to be "correct"	5. Leading students toward predetermined, "correct" explanations
6. Allowing students to identify, try and evaluate their own strategies for solving problems	6. Teaching students the steps for problem solving
7. Allowing students to reach tentative conclusions based on current information	7. Making sure that students leave the classroom with correct answers
8. Exploring the meaning of truth with the students and allowing them to seek their own truth	8. Disregard for truth
9. Allowing students to develop personal meaning from accumulated knowledge and conventional practices	9. Discounting or ignoring accumulated knowledge or conventional practices
10. Interacting with students in any situation where student-initiated behavior is the goal	10. Planning an activity that takes place once a week for an hour
11. Using interaction skills gained through study, practice and use	11. Just something that anyone can do
12. Conceptualizing and considering the development of autonomous learners in a new way	12. Something that we have always done in the classroom
13. Interacting with students in a manner consistent with educational goals identified and valued by the teacher	13. Ignoring other ways that students can and do learn

ROUND I:
HELPING SOMEONE SAY WHAT HE MEANS

Handout 3.2

SPEAKER: After reading his statement aloud, the speaker should try to explain what information he needs from the listener to clarify it. He should let the listener know:

1. HOW he wants to be helped a. "Identify words that are not clear to you." b. "Tell me what you think I mean." c. "Give me an example of what I've said." d. "Ask me questions about what I've said."	
2. WHEN he has been helped	
3. IN WHAT WAYS he has been helped	
4. WHEN he has NOT been helped	
5. WHAT HE NEEDS further to be helped	

LISTENER: Some of the listening skills for this practice session are listed on the next page, Handout 3.3. The listener should try to use these skills as he helps the speaker make his statement clear.

OBSERVER: Using the chart above as a guide, the observer should record those actions of the SPEAKER which facilitate clear and easy communication. Make a tally mark each time the speaker does something which lets the listener know more accurately how to help him communicate. After this conversation has ended, the observer should report his observations to the SPEAKER.

ROUND II:
HELPING SOMEONE SAY WHAT HE MEANS

SPEAKER: For this exercise, the speaker should try to describe what information he needs from the listener to clarify his risk/advantage statement. Some skills to practice are listed on the previous page, Handout 3.2.

LISTENER: Utilizing the skills listed below, the listener should try to help the speaker with the kinds of information he needs to clarify his statement.

1. Press for clarification and specificity	
2. Provide the information the speaker requests	
3. Let the speaker know when things are becoming more clear	
4. Let the speaker know when words or ideas are still not clear	
5. Ask for illustrations	

OBSERVER: During this conversation, the observer should watch the LISTENER. If he uses the skills listed above, place a tally mark beside them in the chart. Report your observations to the listener at the end of the round.

ROUND III:
HELPING SOMEONE SAY WHAT HE MEANS

Both the SPEAKER and the LISTENER in Round III will be practicing to help one another make a better statement (Items 1, 3, 5, 7) and to eliminate behavior which interferes with clear communication (Items 2, 4, 6, 8).

The OBSERVER will be watching both the speaker and the listener. Using the chart below as a guide, he should mark a tally beside each inference he draws from their behavior. At the end of the conversation, the observer will report his findings to the other two members. He should try to include in his report examples of behavior from which he drew his conclusions.

	SPEAKER	LISTENER
1. One does something that causes the other to "turn on" and get involved more		
2. One does something that causes the other to withdraw and become less active		
3. Each is listening to the other		
4. One or both are not listening		
5. Each follows the other so a question or statement is not left hanging		
6. One leaves the other's question or statement hanging		
7. Both push hard to get a clear statement, keeping one another honest when things are fuzzy		
8. One or both are "nice" but don't push to make things any clearer		

SUBSET 4
ALLOWING INQUIRY TO HAPPEN

63 Minutes

NOTES TO LEADERS

Some participants find it helpful to stop and start the tape recording after each teacher move.

Occasionally, participants have difficulty accepting the language and terms used to describe teacher verbal behavior. This language will become more familiar to them as the workshop activities progress.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 4
2. Tape recorder ready with TAPE C-II
3. PARTICIPANT MATERIALS

   4.1 Allowing Inquiry to Happen
   4.2 Typescript of Confrontation Tape C-II
   4.3 Answer Sheet for Handout 4.2

   5.1 Generating Data, Evolving Ideas (READING ASSIGNMENT)

SUBSET 4

RATIONALE	MINUTES	SCHEDULE
a)	3	a) Introduce Subset 4, show SCHEDULE OF ACTIVITIES.
b) Participants can better conceptualize the teacher behavior to be presented if they hear again the behavior actually being used by a teacher.	10	b) Play TAPE C-II.
c) Participant conceptions and perceptions will change as a result of formal conceptual input. Some will be reinforced and made clearer by the formal conceptual input. Participants will be better able to learn, understand and use the eighteen tactical moves if they are presented in small groups of six or seven according to their intent.	30	c) Refer to Allowing Inquiry to Happen, HANDOUT 4.1. Ask participants to read and identify teacher intentions.
d) Participants will be able to apply the formal input to a familiar experience at this time.	20	d) Refer to HANDOUT 4.2 and ask trainees to identify teacher moves.
e)		e) Give directions for reading HANDOUT 5.1.

LEADER INPUT

a) During the exercise you will:

1. Read a paper on what the teacher can do to allow inquiry to happen
2. Use a typescript of TAPE C-II, and try to identify some specific moves the teacher makes to allow inquiry
3. Check to see how well you were able to identify the teacher moves

b) You have heard a tape of a teacher interacting with pupils who were inquiring into the pulse glass problem. You have written your own statement on "Why the teacher was responding the way he was." Before we give you a description of what he was intending to do, let's play the tape again, listening to the kinds of responses the teacher made. (Time 10 minutes)

c) HANDOUT 4.1 deals with why the teacher on the tape was responding the way he was. The materials describe his intentions and his actions. Read over the material, paying attention particularly to the teacher's intent. Later you will find there are a total of eighteen possible intentions, which are called moves. We will be working initially with only the first six. The teacher on the tape was working with only the first six sets of intentions. Later, you will be practicing your own individual response, but with the same intentions in mind. Key words or phrases have been underlined to stress intent. You may wish to do your own underlining.

Attempts have been made, and will continue, to reduce words that interfere with clarity rather than help to clarify. Try not to let the vocabulary interfere. We are involved in working out a "descriptive language." You may have some suggestions as to how this language can be improved. (Time 30 minutes)

d) HANDOUT 4.2 is a typescript of Tape C-II. Each of the teacher responses is numbered. Read through the typescript and see if you can place the teacher moves on the tape into the six allowing inquiry categories. Write the name of the tactical move in the numbered space provided. When you begin working, I will pass out an answer sheet. After you have identified the tactical moves, check your answers with those on the answer sheet. If you cannot agree with some of the answers given, discuss them with members of your trio. The exercise is not to identify with complete accuracy the teacher moves. This is not possible. Rather, your task is to analyze what the teacher is doing and see if you can place the teacher moves into the allowing inquiry categories. (Time 20 minutes)

(Pass out HANDOUT 4.3 after participants begin working.)

e) Read HANDOUT 5.1 for our next meeting. It is important that you know the language in the paper for the next exercise. You will be learning to identify inquirer operations and subjects of operations. Be able to name the seven inquirer actions.

"What is Teacher Doing"

The studies of Anderson, and Lippitt and White show rather conclusively that the behavior of the teacher sets the climate of the class.[1] Dick Suchman,[2] in his work at the University of Illinois, has identified the climate which maximizes the opportunity of individuals to inquire. He defines the climate by describing three CONDITIONS which the teacher must establish and maintain through his own behavior.

> FREEDOM: The more rules and restrictions thrown in the way of the child, the fewer choices he has and the less his activity resembles inquiry. But a permissive and relatively unstructured environment is not the total picture with respect to freedom...many children operating in such an environment [are] unable to accept and utilize the freedom. A truly free person has internal freedom as well as external freedom. He must be able and willing to accept and use the responsibility of making his own decisions. In short, a part of freedom is autonomy.
>
> Since autonomy is so much a part of personality, there is no simple way of maximizing autonomy for children. In the long run autonomy goes along with freedom. One learns to be autonomous by gradually making more and more autonomous choices, by being placed in situations where the teacher refuses to lead or program the children and, in a sense, forces them to take a greater part of the responsibility for their own learning. Once a child begins to sense that he has the capacity to grow conceptually under his own steam, he takes more and more of this responsibility.
>
> Much depends on the child's image of himself as a learner. As he comes to see himself as a person capable of gathering data for building and testing theories, he becomes more willing to engage in this activity and less concerned with looking foolish or failing to achieve according to some outside standard. Autonomy does accompany self-confidence, and self-confidence can only come by gaining experience in being autonomous.

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[1] For more detailed information, see:

Anderson, H.H. "The Measurement of Domination and of Socially Integrative Behavior in Teachers' Contacts with Children." Child Development. 10 (1): 73-89; 1939.

Lippitt, Ronald and Ralph K. White. "The 'Social Climate' of Children's Groups." Child Behavior and Development. Barker, R.G., et al. (eds.) New York: McGraw Hill, 1943. Chapter 28, 485-508.

[2] Suchman, Richard J. "The Conditions for Inquiry." Instructor. 75:30+; November 1965. Reproduced by permission of the author.

RESPONSIVENESS: A lone child in a completely bare room may have all the freedom he wants, but his capacity to inquire is tremendously restricted by the fact that he has no means of gathering data. Even if his ideas are rich and fluent, he is going to find it very difficult to engage in inquiry if he has no source of data to test ideas or to generate new ones. This is why a responsive environment is considered a crucial condition for inquiry. The inquirer must have a rich supply of data available when he wants them.

Another very important aspect of responsiveness is the way the teacher responds to the child. Children who inquire freely and have access to a responsive statement are bound to come up with ideas of their own, formulations that represent the way the child sees and attempts to account for the phenomena of his world. The formulation of such ideas is enormously important to the inquiry process and to the overall growth of the child. For this reason, it is essential that the teacher listen to the ideas of the child and make room for his expression. Unless the child externalizes these thoughts by bringing them out into the open to be looked at, the teacher may never be able to respond adequately to the child.

Inquiry thrives on the generation of theory but children will not pursue the generation of theory unless they feel that their formulations and thoughts will be received and considered.

FOCUS: Inquiry is most productive when it has direction and purpose. If all searching is diffused, there is never enough total mobilization of energy to penetrate a particular area of interest far enough to make a concerted gain in conceptual growth.

One way to provide a focus is to confront the child with an event that puzzles him. Such an event may be referred to as discrepant in the sense that it presents a phenomena that does not coincide with the child's knowledge and understanding of the world. A gap is created between what the child perceives and what he knows. The discrepant event provides not only a motivation to inquire, but also a focal point toward which the process of inquiry can be aimed.

> Focusing, however, is not a one-shot activity. It is often necessary for a teacher to step into a situation in order to resharpen the focus of inquiry. Too often, children find satisfaction in a theory without really testing whether or not the theory matches reality. Nothing will get in the way of inquiry more than an oversimplified explanation that provides a feeling of closure. A teacher can effectively restimulate the process of inquiry by raising new questions that challenge the child's theory.
>
> Focusing is not a matter of giving approval or disapproval, but a question of redirecting the child's attention to discrepancies and thus sharpening the focus for the child so that inquiry can continue productively rather than ending in a quagmire of unjustified closure. The teacher provides the child with the wherewithal to build and test theories.
>
> The rejection of an idea that a child creates should be his own rejection. That is, if his idea does not stand up in the face of the data he has gathered, then he himself should reject the idea. If, however, he has no basis for rejecting the idea himself, he should not be told that the idea is wrong. In other words, the teacher will guide the child in the matching process, but the teacher will not do the matching for him.

Focus may take two directions. Initially and essentially, the focus of the inquirer is on resolution of the problem event or situation. Gradually, through teacher behavior, a second focus emerges--a focus on process. The teacher brings about a focus upon the processes on inquiry. A focus on process is a necessary condition to facilitate growth in the development of more productive, systematic ways of confronting and dealing with future problem focus events. Gradually, through teacher's guidance and support, children become aware of what inquiry is. As a result of process focusing, they become increasingly able to confront and successfully deal with the fundamental question of inquiry, "How do you know if a theory is a useful one?"

Often, children do this intuitively, but they do not realize and are perhaps unable to verbalize the concept of what is deliberate action to this process.

As mentioned earlier, the topic of this workshop is concerned with classroom verbal interaction which allows and facilitates inquiry on the part of students. The question then arises, "What is it, specifically, that the teacher can do through his own verbal behavior to maintain the conditions of FREEDOM, FOCUS and RESPONSIVE ENVIRONMENT?"

The following pages are in answer to this question. You will be learning the specific teacher interaction skills which allow students to inquire.

TEACHER TACTICAL MOVES
ALLOWING INQUIRY TO HAPPEN

Handout 4.1

Suchman identified the general conditions essential to inquiry and the growth of inquirers. Strasser,[1] building on Suchman's work, identified 22 categories of teacher verbal interaction, called TACTICAL MOVES, which the teacher uses to facilitate inquiry. Here, the 22 tactical moves have been reduced to 18 and reorganized to simplify learning and practice.

ALLOWING INQUIRY TO HAPPEN

1. Focus Setting
2. Structuring
3. Clarifying
4. Accepting
5. Responding to Data Probe
6. Teacher Silence

When learning and practicing these moves you are primarily concerned with establishing and maintaining the conditions for inquiry. Notice, your main intent is to define roles, facilitate communication and develop trust.

FACILITATING AUTONOMOUS STUDENT GROWTH

7. Identifying Inquiry Operations, Subjects of Operations
8. Identifying Inquiry Products: Data and Theory
9. Probe for Specificity
10. Teacher Probe for Data
11. Teacher Probe for Operations
12. Operation Clue Giving
13. Instructing

TUNING IN TO STUDENT FEELINGS, ATTITUDES, PERCEPTIONS

14. Probe for Theory, Status of a Theory, Inference
15. Probe for Intent of Operations, Intent of Subjects of Operations
16. Probe for Prediction, Explanation
17. Giving Data, Theories
18. Data Clue Giving

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[1] Strasser, Ben B. Components of a Teaching Strategy: Tactical Moves in Inquiry, Unit I. San Anselmo, California: Search Models Unlimited, 1967, Pages 9-21.

Teacher Tactical Moves
Allowing Inquiry to Happen

Handout 4.1

Here, the concern is with learning and practicing the moves which ALLOW INQUIRY TO HAPPEN. On the following pages each move is described four ways: Teacher INTENT, Teacher ACTION, Student ACTION and Student EFFECT. As you examine the moves and prepare to practice them, consider the four descriptions in the following manner:

Teacher INTENT:	An unobservable purpose you want to fulfill
Teacher ACTION:	Something observable you do to fulfill your intent
Student ACTION:	Something observable you expect the student to do in response to your action
Student EFFECT:	Some unobservable inner state of the student that you hope to be the result of your action

On each of the following pages, begin by reading the INTENT of the move in the first column. In some cases, a move will have more than one intent. Then become familiar with the teacher ACTIONS that are consistent with the identified intent. The teacher actions are those things the teacher says or does that are intended to bring about a desired response from students. The actions identified in the second column are those which have been found particularly useful to fulfill the stated intent. Refer then to the third and fourth columns which identify the anticipated and desired student responses. In this exercise it is important that you recognize the intent of each move and the actions which you can take to fulfill each intent.

FOCUS SETTING

Handout 4.1

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response by students to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Make a topic, legitimate for classroom or individual inquiry as identified by either teacher or student Get students motivated to take action on their own	1) Presents a problem event containing contrast or conflict 2) Asks students to explain event 3) Presents a problem event and allows students to identify problem 4) Allows students to present problem event 5) Accepts problem identified by student	1) Asks questions about the problem 2) Shares an idea about the problem 3) States a problem after seeing an event 4) Asks questions about problem he has identified 5) Asks questions about his role	1) Wants to become involved in problem 2) Initially wonders "What's going on?"
Intention II: Have students consider and reflect on processes	1) Asks questions about process elements: a) What is a theory? b) Where do theories come from? c) How do you get going if you don't have a theory? d) How does one come to know something?	1) Responds with his own perceptions of process 2) Shares something about process from his own experience 3) Makes a discrimination concerning process based on his own experience	1) Feels the process is helpful to him 2) Willing to discuss process 3) Values the chance to talk about what he does

STRUCTURING

Handout 4.1

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable responses by students to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Communicate a "different" kind of role for each, the teacher and students Establish the ground rules under which the roles will operate	1) Tells students they can identify their own problem for inquiry 2) Tells students they program their own "problem answer"; the teacher doesn't do it for them 3) Tells students he is there to listen to their ideas and will give his undivided attention while one is talking 4) Tells students or lets them know how they can gather data through the teacher, books, other persons, etc. 5) Tells students he doesn't judge student's ideas; students judge their own ideas; he doesn't say "yes" or "no" when a student asks, "Is my idea right?" or "Did it happen because...?" 6) Tells students he gives data but not answers 7) Tells students if they feel pressured to respond, they can ask the teacher to move away by saying "pass" or another signal 8) Tells students if they want to consult with other students, they can call for a "conference" 9) Tells students he doesn't call on them unless they indicate they want to speak	1) Students respond to the problem differently, some gathering data, others theorizing 2) Identifies a problem not identified by the teacher or another student 3) Lets the teacher know when he is through talking 4) Gathers data through different operations 5) Asks the teacher if his idea is right without knowing how to test the idea 6) Shares an idea without asking the teacher if his idea is right 7) Says "pass" 8) Tests a theory 9) Asks a series of questions related to one variable within the problem 10) Asks for a conference 11) Asks for a repeat of the problem event 12) Shares a previous experience he has had 13) Holds floor for long period of time 14) Doesn't participate during a given experience	1) Increased confidence about sharing his ideas 2) More willing to risk a far out idea 3) Enjoys "messing" with the problem 4) Doubts he has as much freedom as the teacher suggests 5) Wants closure and answer 6) Feels good about being able to "control" the environment

CLARIFYING

Handout 4.1

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response by the student to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Understand, in terms of the process, what the student is saying, how he is using a word or concept and what he is trying to do	1) Asks a student what he means when he uses a certain word 2) Asks a student to repeat what he said 3) Asks a student, "Are you saying..." and then paraphrases 4) Asks a student, "Are you trying to get at data or are you sharing an idea?" 5) Asks the student to illustrate on the chalk board 6) Asks another student or allows a student to interpret 7) Restates a student's question 8) Asks the student to give an example 9) Asks a student what he is going to do or is doing (process being used) when involved with equipment, books, pictures, etc.	1) Repeats what he has said 2) Says, "No, that's not what I mean," or "Yes, that's what I mean." 3) Says, "No, that's not quite," and then adds more to his message 4) Gives an example or analogy 5) Uses the chalkboard to illustrate 6) Continues to interact with the teacher after two or three probes at clarity by the teacher 7) Tells if he is after data or sharing an idea 8) Defines a word he has used and then uses the definition again in subsequent dialogue with teacher 9) Sharpens a message to fine clarity after having had teacher seek clarity on previous occasions 10) Over time, finds teacher having to ask less, "What do you mean?"	1) Trusts teacher 2) Appreciates teacher's support 3) Increasingly values his own ideas and his own ability to have ideas 4) Values his own communication skills and wants to enhance them 5) Values communication with teacher (and other students)

ACCEPTING

Handout 4.1

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response by the student to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Communicate that the student's ideas and thinking are valued by the teacher but are not judged by him; and that the expression of feelings is legitimate	1) Says, "OK," or "I understand" 2) Says, "It's important to explore all your ideas" 3) Says, "It's important to want to know about that" 4) Says, "Well, it certainly could be," or "Well, it certainly might be." 5) Says, "Well, I guess things like that could make a difference" 6) Says, "I understand, you're saying..." (repeats or paraphrases what student has said) 7) Checks on perceptions he has about student's feelings 8) Acknowledges feelings that student shares	1) Shares an idea which is "far from convention or stereotype" 2) Says he doesn't like something or he thinks something is stupid 3) Sticks with an idea even if some other students laugh at it 4) Says when he thinks he has received bad data from the teacher 5) Asks to be allowed to get "his own answer" 6) States an idea and then does something to get data to test the idea 7) Becomes actively involved after period of inactivity 8) Provides feedback when teacher checks his perceptions 9) Asks if his idea is good or right 10) Asks for the "right" answer	1) Senses power in his own ideas 2) Challenged to find ways of finding his own answer 3) Feels frustrated when he can't get closure 4) Trusts teacher and other students 5) Values his own abilities to build an idea 6) Willing to stand alone or express a "way out" idea

RESPONDING TO DATA PROBE

Handout 4.1

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response by the student to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Make data available to students when they request it	1) Says, "yes," or "no," if student requests data through question that can be answered this way 2) Answers a student's data request question by providing data 3) Makes available books, prints, equipment, other resources at student's request for data 4) Asks another member of the group if he has data that is being requested by student 5) Arranges for visit to primary data source when such data is requested by students	1) Asks for data 2) Asks if he can go to data source 3) Selects more than one data source 4) Consults one data source and then turns to another 5) Makes four, five, six data probes in rapid order 6) Follows the statement of a theory with data probe to test his theory 7) Performs an experiment verbally, that could only be duplicated in finest clinical settings 8) Uses both verification and experimentation operations 9) Goes to data source spontaneously	1) Feels in control of his own data processing 2) Feels power in being able to build his own ideas rapidly 3) Values data as the basis for building and testing ideas 4) Evaluates data against source

TEACHER SILENCE

Handout 4.1

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response by the student to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Have students initiate their own action and provide "think" time	1) Gives problem event and focusing question, then waits until students talk 2) Waits when there is a lull in the discussion for a student to talk 3) Waits, when a student is talking then stops, for the student to go on or say he is through 4) When students ask for "conference," moves away from the conference and waits for it to end	1) Breaks the silence by asking a question or making a statement 2) Breaks the silence by giggling or laughing 3) Breaks the silence by talking to another student 4) Remains quiet up to a minute of silence 5) Begins to talk whenever there is a moment of silence 6) Having asked for conference, moves away from teacher	1) Feels uncomfortable during periods of silence 2) Appreciates period of silence being allowed 3) Values periods of silence as time to organize own thoughts 4) Says something or takes action because he needs to, not because he thinks someone expects it

OBSERVABLE STUDENT ACTIONS INDICATING INTUITIVE RESPONSE

Handout 4.1

This list is a summary of the student actions taken from the student action columns found on the preceding pages. They are the student behaviors which a leader can theoretically expect when using the allowing inquiry moves. They are the behaviors which define the "Inquiring Student" at the level where he is acting rather naturally in terms of his own expectations, interests and needs rather than those of the leader.

1. Asks questions about the problem.
2. Shares an idea about the problem
3. States a problem after seeing a problem event
4. Asks questions about a problem he has identified
5. Identifies a problem not recognized by the teacher or another student
6. Gathers data through different operations
7. Asks the teacher if his idea is right
8. Shares an idea without asking the teacher if his idea is right
9. Shares an idea which is "far from convention or stereotype"
10. Asks for the "right" answer
11. Asks if he can go to data source
12. Performs the operation suggested by the teacher
13. Follows the example given by the teacher and performs the operation
14. Asks for data in response to teacher's data clue
15. Shares an experience he has had

RATIONALE FOR TEACHER TACTICAL MOVES

Handout 4.1

This page is included to answer the question, "Why should the leader use the moves allowing inquiry?" It establishes a rationale of leader behavior where the leader values facilitating student inquiry.

Focus Setting	Inquiry to be productive and meaningful must have direction and purpose.
Structuring	If students are to develop autonomy, they need to understand their decision-making role.
Clarifying	The teacher must understand what students are saying if he is to help the student develop an individual, personal idea.
Accepting	Students are more apt to share ideas and find ways of judging their ideas if the teacher's role is to listen and accept ideas rather than to judge them.
Responding to Data Probe	Students need to program their own data input if they are to build ideas and make judgments which have meaning to them. Students become aware of the processes for building personal knowledge when they can control the data input used in developing their own ideas. Only the student has knowledge of what data is relevant to the idea he holds or that he is building.
Silence	Students will never take action on their own if the teacher is always the initiator of action. Students and teachers need "think" time to develop processes for building personal knowledge.

TYPESCRIPT OF CONFRONTATION TAPE II

Handout 4.2

This exercise involves identifying those moves on the following typescript which allow inquiry to happen in the classroom. Each of the teacher responses is numbered. Read through the typescript and try to place each teacher move into one of the six categories listed in the box on page 64. Write the name of the tactical move into the space provided. After you have identified them, check your answers with those provided on Handout 4.3. This exercise is not to identify the teacher moves with complete accuracy but rather to analyze what the teacher is doing. See if you can place the teacher's responses into the six categories allowing inquiry.

1. ______________________

T: Well, let me tell you a little bit about what we are going to do. I am going to do a science experiment, I guess you could call it, and then I'll pose a question about it and it is up to you to see if we can figure out what makes it work the way it does.

S: I think we tried this once before last year in school, except they did something and asked us a question why did this happen and we all gave our theories and we finally got it....

S: And the teacher would answer the question, all she could answer was yes or no.

2. ______________________

T: Oh yeah.

S: Or maybe or, you know, ask you a question and they don't quite understand.

3. ______________________

T: Well, we'll probably work much the same way, that is, you can ask me questions about it. Some questions I may answer directly and others I may not, you'll see how we'll work that. And a couple of other things, when you did it in your classrooms, those of you who did it, when you were through did you say, "I pass" or anything like that?

S: Usually we said, "I pass" or something like that.

Typescript of Confrontation Tape II

Handout 4.2

T: OK, sure. And let's see, you can make as many comments or pose as many questions as you want to at one time. The reason why I say that is so you know you don't have to ask one question and stop, but you can say the kinds of things you want to say or ask the kinds of questions you want to ask, as long as you wish. You have the floor as long as we're looking at you or talking with you. One other thing we'll ask you to do or that you can do, is call for a conference. If, when you're working on a problem, you decide, Mike, that you would like to talk to Stewart or you would like to talk to Charles over here or Tom, if you would like to talk with each other, one way you can let me know is to say, "May we have a conference." We'll stop what we are doing and give you a chance to talk to each other about it, OK? So if you want to talk among yourselves, say, we'll stop the tape and wait a little bit until you get a chance to do it. You know, talk about what you want to talk about, share your ideas or whatever. Then we'll continue from where we left off.

4. ______________________

OK. Here is a....

S: Yeah....

5. ______________________

T: Does this look familiar to you?

S: That's what we used at school.

T: Good. Well, we'll see what happens when we try it, OK?

Here is one kind of problem and question that you can worry about, it's, "Why does the liquid move?"

6. ______________________

S: Oh, I think I know. The heat in your hand makes....

S: The liquid expands and it flows along....

Typescript of Confrontation Tape II

Handout 4.2

S: And the heat of your hand makes the molecules in the water rearrange and move faster and faster and it has to go somewhere and so it goes to the other.

7. ____________________ T: OK.

8. ____________________ (...30 second silence)

S: Is the liquid, does it go through all of the tube, or does it just run on the side? I mean, if you have a tube like this, I mean, if the liquid just runs on this side and this and all that, and it doesn't go through the middle, does that go all the way through the whole thing?

T: Yes, it does, it's like...the tube's kind of like a hose, and it goes right through the whole tube, yeah, sure.

9. ____________________

10. ____________________ (...45 second silence)

S: Is that some sort of a chemical in there or is it just something?

S: It's colored water.

11. ____________________ T: Is it colored water? No, it's not.

S: Is it a chemical?

S: It couldn't be colored water or else it wouldn't do that.

S: Is it a chemical?

12. ____________________ T: What do you mean by a chemical, Charles?

Charles: Well, um, not really water, but um...I don't know just how you would say it, but find a chemical, uh, something that would react more or something.

T: Are you asking, is there something special about the liquid or something that makes it react more?

13. ____________________

S: Yes.

Typescript of Confrontation Tape II

Handout 4.2

S: Could it be sulfuric acid?

T: Is it sulfuric acid? Let me respond to Charles first and then I'll.... I'll tell you what, it just occurred to me that on the tape we are making, that it would be helpful if we gave your names before we speak so we know who is speaking. If you would just raise your hand or something so I know you are going to talk. Then I'll say Charles or you can say your name before you start talking. If Jenny has something to say, you can say "Jenny" and then go on with what you are saying, OK.

14. ____________________

Now, you are asking...I said all those things and I forgot what your question was, Charles.

15. ____________________

Charles: Is that something special that will react in a certain way?

16. ____________________ T: It could be.

Jerry: Putting your fingers there, does it stop the...that stuff from flowing the other way?

17. ____________________ T: Does putting my fingers in here stop it?

Jerry: Yes.

18. ____________________ T: It could.

Stewart: Does that kind of pointed thing on the top have anything...on the top of the one thing, does it have anything to do with anything else? With the experiment?

T: I suppose it could have something to do with it.

19. ____________________

S: Can't air get in through there?

20. ____________________ T: No, it's sealed off tight.

Jerry: Why did they put that there?

S: Is that the way they just sealed it?

Typescript of
Confrontation Tape II

Handout 4.2

T: Yeah, that's part of the process of the way they make it. Part of the process of making it. Does that answer the question that you were worried about, Jerry?

21. ________________________

Jerry: Not really.

22. ________________________ T: Mike, you have a question.

Mike: Well, would you tip it...I want to see it all...it can all fit in one of those things.

T: How would you like it tipped over Mike, like this? Do you want me to see if I can get it all in one ball?

23. ________________________

Jerry: I want to see if it would go.

T: Is that what you wanted me to do? There is still a little bit up there. OK.

24. ________________________

S: Do you have to slant the tube at all when you put your hands on it so that the, whatever it is, the liquid will go through it better?

T: Charles, could you tell me what you mean by, "...do I have to"?

25. ________________________

Charles: Well, instead of just holding it like this, uh, if holding it like this, would this make it flow through better or would it....

26. ________________________ T: Do you want to do something with it?

Charles: Would...oh boy, well, I was just wondering (I think I have it) that if tilting it, I mean not having it level, but tilting it would make it flow through faster.

ANSWER SHEET FOR HANDOUT 4.2

Handout 4.3

1.	STRUCTURING	The teacher is letting the students know it is their job to explain the event.
2.	ACCEPTING	
3.	STRUCTURING	The teacher is establishing ground rules.
4.	STRUCTURING	The teacher continues to establish ground rules.
5.		It is difficult to fit this teacher action into any of the intent categories having to do with Allowing Inquiry. Here, it appears the teacher is trying to get some data about the students.
6.	FOCUS SETTING	The teacher is confronting students with a problem event.
7.	ACCEPTING	
8.	TEACHER SILENCE	The teacher waited for a student to break the lull in the conversation.
9.	RESPONDING TO DATA PROBE	Student has requested data and teacher is providing it.
10.	TEACHER SILENCE	
11.	RESPONDING TO DATA PROBE	
12.	CLARIFYING	The teacher asks a student what he means by a word that he has used.
13.	CLARIFYING	Teacher attempts to understand what the student is trying to do.
14.	STRUCTURING	Teacher stops to establish more ground rules.
15.	CLARIFYING	Teacher wants to understand what information the student needs.
16.	ACCEPTING	Teacher is just accepting the student's idea; teacher not judging the idea.
17.	CLARIFYING	Teacher attempts to understand what the student is trying to find out.
18.	ACCEPTING	
19.	ACCEPTING	Teacher accepts the idea and allows the student to decide if the tip has to do with anything else.

Answer Sheet for Handout 4.2

20.	RESPONDING TO DATA PROBE	Student asks for data and teacher provides it.
21.	RESPONDING TO DATA PROBE	
22.	...	It is difficult to put this response into any of the intent categories to allow inquiry. Teacher is calling on a student who wishes to speak.
23.	CLARIFYING	Teacher is trying to find out what information the student is after by asking how he wants the pulse glass held.
24.	CLARIFYING	Teacher is checking to see if the student got the information he was after.
25.	CLARIFYING	Teacher is trying to understand what a student means.
26.	CLARIFYING	Teacher is trying to find out what kind of information a student is after.

SUBSET 5
INQUIRER BEHAVIOR

290 Minutes

NOTES TO LEADERS

This is a long subset. For the 14-day workshop design it is divided between the third and fourth meetings. It is suggested that the subset be divided also for the 7-day design. Activities d through f should be left for the first hour of the third day.

When the leader notices the participants are about to use HANDOUT 5.13, he should let them know they are about to identify subjects of operations. Participants need this reminder.

Trios should pace themselves through this subset while working on Activity e. They should move as rapidly as possible through the exercises without interruption.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 5
2. Be ready to distribute HANDOUT 5.17
3. PARTICIPANT MATERIALS

    5.1 Generating Data, Evolving Ideas
    5.2 Cycling Order
    5.3 Analogy, Necessity, Synthesis: Exercise I
    5.4 Analogy, Necessity, Synthesis: Exercise II
    5.5 Verification, Experimentation: Exercise I
    5.6 Verification, Experimentation: Exercise II
    5.7 Problem Focus, Theoretical Data: Exercise I
    5.8 Problem Focus, Theoretical Data: Exercise II
    5.9 Verification, Experimentation, Analogy, Necessity, Synthesis: Exercise I
    5.10 Verification, Experimentation, Analogy, Necessity, Synthesis: Exercise II
    5.11 Verification, Experimentation, Analogy, Necessity, Synthesis, Problem Focus, Theoretical Data: Exercise I
    5.12 Verification, Experimentation, Analogy, Necessity, Synthesis, Problem Focus, Theoretical Data: Exercise II
    5.13 Subject of Operations: Exercise I
    5.14 Subject of Operations: Exercise II
    5.15 Subject of Operations: Exercise III
    5.16 Self-Test for Identifying Operations and Subjects of Operations
    5.17 Answer Sheet for Self-Test on Identification
    5.18 Classroom Interaction

SUBSET 5

	RATIONALE	MINUTES		SCHEDULE
a)		3	a)	Introduce Subset 5 Show SCHEDULE OF ACTIVITIES.
b)	At this point, participants have a need to conceptualize inquirer behavior. Participants will better understand the concepts of behavior if they read or review them in the workshop setting. There, they can discuss them and seek understanding through trio members and in small groups. Being able to recite names of student behaviors is the first step in discriminating and classifying live behaviors. Participants need opportunity to relate concepts to actual behavior in order to begin identifying them in students.	12	b)	Refer participants to HANDOUT 5.1 and give time to review.

LEADER INPUT

a) The teacher who intends to allow inquiry to happen uses specific tactical moves. But for the most part the selection or use of a move depends upon the action the inquirer is taking or has taken. It is not only important that the teacher know the intent of the tactical move, but it is equally important that he be able to identify the inquirer action in order to select the right move.

In this activity you will:

1. Read a description of inquirer actions
2. Use a trio exercise to practice identifying and responding to inquirer actions
3. Check yourself to see how well you've done

b) HANDOUT 5.1 describes what inquirers do. Quickly review it. (Time 12 minutes)

SUBSET 5

RATIONALE	MINUTES	SCHEDULE
c) Participants will learn to identify inquirer behaviors best when the behaviors they are attempting to classify are all taken from the same problem focus. They will be able to transfer and apply these identification skills to inquirer behavior from other problem focuses.	210	c) Refer participants to HANDOUT 5.2. Give directions for working in trios on cycling for HANDOUTS 5.3 through 5.16.
Participants need to learn to identify and classify actions if they are to maximize student freedom and help the student analyze the degree to which his actions are productive.		
Participants will learn quickly to identify and classify inquirer actions if they: 1) First, differentiate between two or more contrasting actions 2) Next, identify or classify a single action 3) Finally, produce their own example of a specific action		
Learning to differentiate will be greatly facilitated by taking all actions to be differentiated from the same problem focus.		
Learning to differentiate will be facilitated by beginning with only a few actions and gradually increasing the number until the entire seven actions are presented.		
Some participants will need more than one experience at making the initial discriminations. They will need to recycle through different exercises.		

LEADER INPUT

c) You will be working in your trios learning to identify and respond to inquirer actions. You will be using HANDOUTS 5.3 through 5.16. (See page 5 for alternatives where there are not an even number of trainees.)

These exercises are used in sets. One sheet contains some inquirer actions concerning the pulse glass problem. The others are answer sheets which identify inquirer actions and possible teacher moves in response.

Look at HANDOUT 5.2 to see the order in which these sets will be used. Notice that each trio begins with Handout 5.3. If the trio gets two-thirds of the items correct, they can follow the arrows straight down to Handout 5.5. However, if the trio gets less than two-thirds of the items correct, they should try another set dealing with the same kind of inquirer actions. In this case, they follow the diagonal line to Handout 5.4, then go on to Handout 5.5. If the trio gets two-thirds of the items correct on Handout 5.5, they go straight down to Handout 5.7. If they fail to get two-thirds correct, they follow the diagonal line to Handout 5.6, then on to Handout 5.7. Each trio follows the path that best helps it achieve two-thirds accuracy in identifying and responding to inquirer actions.

Look at Handout 5.3 containing the inquirer actions. Notice they are divided into Sets I, II, III. Within your trio you will have the tasks of teacher, student and answer man. These tasks will shift for each set. For the first group, a trio member in the task of student reads the first inquirer action, "The heat in your hand made it go."

THE TRIO MEMBER IN THE TASK OF TEACHER FOR THE FIRST SET, RESPONDS TO THE STUDENT AS HE SEES FIT, USING AN ALLOWING INQUIRY TACTICAL MOVE. HE THEN IDENTIFIES THE INQUIRER ACTION.

The trio member in the task of answer man for the first set, will read the correct classification of the inquirer action and the possible teacher responses to allow inquiry. This procedure is repeated for each item of Set I. Then the tasks rotate around the trio for Set II. Now the "new" student will read Item 6 and the "new" answer man will read from the answer sheet. By the end of Set III, each trio member will have performed all three tasks. USE ONLY ONE COPY OF EACH HANDOUT, rotating them around the trio. It is particularly important to keep answer sheets out of sight of all members except for the answer man.

After finishing with Set III, the trio will move to another exercise on the next Handout and begin again.

RATIONALE	MINUTES	SCHEDULE
c)		c) Continued
d)	30	d) Refer participants to HANDOUT 5.16.
e)	15	e) Pass out the answer sheet, HANDOUT 5.17 and give directions for use.
f)	20	f) Refer to HANDOUT 5.18 and give directions for use.

LEADER INPUT

c) Three reminders before starting:

1. One intent of the clarifying move is to find out what a student is trying to do if you don't understand. You may want to use that move here, in which case, the trio member with the task of student will have to improvise the information for clarity as best he can.

2. Don't worry unnecessarily about providing correct data when you have the task of teacher. Focus on identifying the inquirer action and providing an appropriate teacher response. These student responses have been collected from different groups working on the pulse glass problem. They include responses from adults as well as children.

3. WHEN YOU REACH HANDOUT 5.13 YOU WILL IDENTIFY THE SUBJECT OF OPERATIONS. BE PREPARED FOR THIS CHANGE.

Rotate around among trios watching how time is going. (Time 210 minutes)

d) Use the self-test on HANDOUT 5.16 to see how well you have done in learning to identify and respond to inquirer actions. Follow the directions at the top of the sheet. When you finish, I will pass out an answer sheet so you can check your own responses. (Time 30 minutes)

e) Here is an answer sheet giving the identification of the inquirer action, subject of the action and possible teacher responses for each of the items on the self-test. Compare your answers to those on this handout. If you have disagreements, ask members of your trio to help clarify. At this point in the training, you should have been able to identify and respond to 55 percent of the inquirer actions. Your skill will increase as the training continues. (Time 15 minutes) NOTE: Page 152 has now been omitted.

f) HANDOUT 5.18 is not new to you. You used it during the first exercise. Complete it again and then check it against your first sheet. Have your reasons for responding changed? Has your identification of inquirer action changed? (Time 20 minutes)

It has been said that inquiry is what people do when they are left to learn on their own.

> Bill has just finished building a model glider. He is in a local park ready to test-glide it. He gets down on one knee to keep close to the ground for the plane's first test flight. Then quickly, but gently he pushes the plane forward as he releases it. The nose of the plane rises sharply until it points almost straight up. Suddenly it stops in midair, falls backward, rolls over, and hits the ground almost straight on.
>
> "Must have thrown it up," Bill said to himself.
>
> After checking for damage, he repeats his throw, making sure this time that he throws the glider in a straight line. The plane repeats its erratic flight, again hitting the ground nose first.
>
> This time he carefully points the nose down slightly as he releases it. The craft repeats its performance, hitting the ground sharply a third time.
>
> "Now, why does it do that?" Bill murmurs to himself.
>
> "Maybe it has something to do with weight. Maybe the nose of the airplane needs to be heavier." It suddenly strikes him that if he moves the wing to the rear it might be less likely to "nose up" in flight.
>
> "Sure, the wing is what lifts the airplane. The wing is like a balance point. It's probably doing that because the nose isn't heavy enough. That's probably it."
>
> He then shifts the wing a bit to the rear and releases the glider in a straight line as he did before. Now the craft has less tendency to stall. The flight path is more smooth.
>
> By shifting the wing further and further to the rear during a carefully sequenced series of trials, Bill found he could make the glider fly as he wished, and to make a smooth landing.
>
> "At last," he thought.

Inquiry is motivated by the need to know. The act of inquiring may be described as "messing with things, messing with ideas, and messing with things again."

> Bill was in search of a way to make his airplane follow a smooth glide path. As he initially messed with the airplane, the flight path was quite erratic. In his initial "messing with things"

Bill gathered data about the flight characteristics of the plane--as he originally assembled it.

Because of the way the plane flew, Bill began to consider his "angle of throwing" idea. Now he messed with the airplane by throwing it differently.

When throwing the plane level and in a downward direction had no effect on the flight path, another idea seemed more significant. He considered the "balance point" idea. Consequently Bill messed with this idea by changing the position of the wing on the body of the airplane.

When inquiring, one moves from data to idea, from idea to data, to idea, back to data, etc. Thus, part of inquiry includes random and/or systematic messing with things to generate data in search of relevant ideas. As data is amassed, ideas evolve. With an idea in mind, messing with things takes on new purpose and direction. Certain new data is identified and sought to which the idea will be applied.

Thus, two general classes of inquiry action becomes apparent, GENERATING DATA and EVOLVING IDEAS. To clarify the process of generating data and evolving ideas, look again at the following narrative of Bill and his glider. His data generating actions are underlined and identified with "GD." His evolving idea actions have been underlined and identified with an "EI."

Note the actual data Bill gathered has not been underlined. We are directing our attention here to generating data as an action.

Bill has just finished building a model glider. He is in a local park ready to test-glide it. He gets down on one knee to keep close to the ground for the plane's first test flight. Then quickly, but gently, he pushes the plane forward as he releases it. (GD) The nose of the plane rises sharply until it points almost straight up. Suddenly it stops in midair, falls backward, rolls over, and hits the ground almost straight on.

"Must have thrown it up," (EI) Bill said to himself.

After checking for damage, he launches the glider a second time, making sure this time that he throws the glider in a straight line. (GD) The plane repeats its erratic flight, again hitting the ground nose first.

For third test, he carefully points the nose down slightly as he releases it. (GD) The craft repeats its performance, hitting the ground sharply.

"Now, why does it do that?" Bill murmurs to himself.

"Maybe it has something to do with weight. Maybe the nose of the airplane needs to be heavier." (EI) It suddenly strikes him that if he moves the wing to the rear it might be less likely to "nose up" in flight.

"Sure, the wing is what lifts the airplane. The wing is like a balance point. It's probably doing that because the nose isn't heavy enough. (EI) That's probably it."

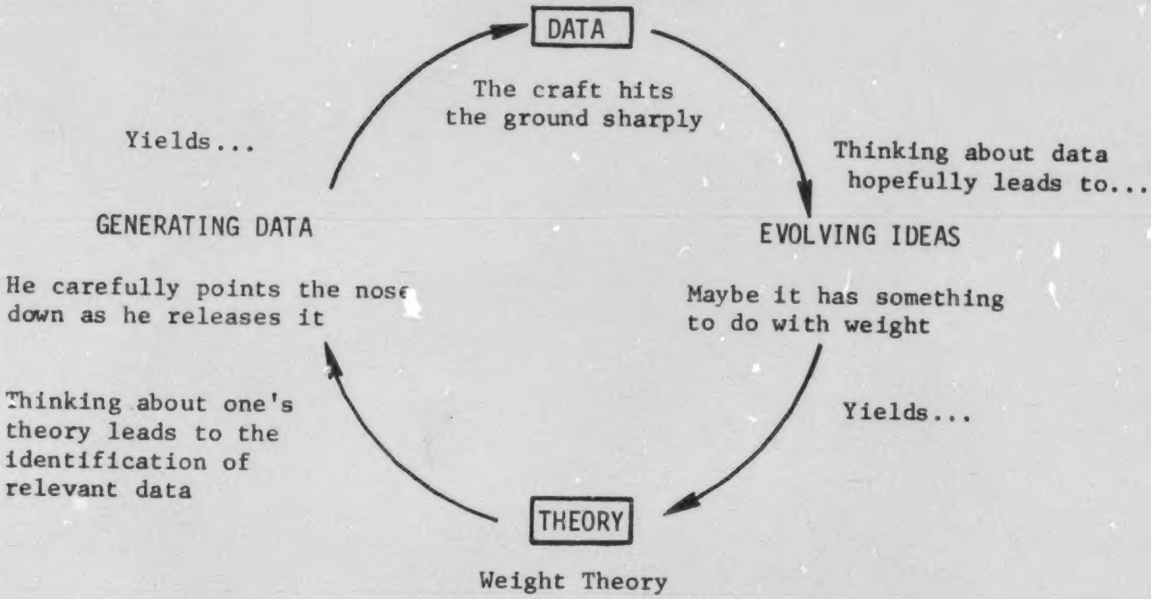
He then shifts the wing a bit to the rear and releases the glider in a straight line as he did before. (GD) Now the craft has less tendency to stall. The flight path is more smooth.

By shifting the wing further and further to the rear during a carefully sequenced series of trials, (GD) Bill found he could make the glider fly as he wished, and to make a smooth landing.

"At last," he thought.

The general classes of inquiry actions--generating data and evolving ideas--may be diagramed as follows:

A DATA THEORY CYCLE[1]


DATA
The craft hits the ground sharply
Yields...
Thinking about data hopefully leads to...
GENERATING DATA
EVOLVING IDEAS
He carefully points the nose down as he releases it
Maybe it has something to do with weight
Thinking about one's theory leads to the identification of relevant data
Yields...
THEORY
Weight Theory

---

[1] "A Data Theory Cycle" originally appeared in "Diagnosis and Evaluation in Inquiry," Unit Six of Inquiry Development Extension Service, Chicago: Science Research Associates, 1967, page 2.

Generating Data, Evolving Ideas

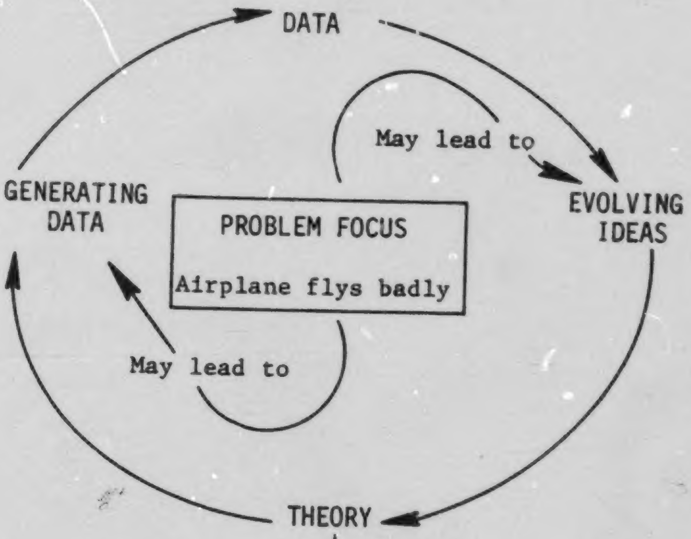
Handout 5.1

Notice the difference between Bill's generating data action and his evolving idea action. In the case of generating data there is open, observable action. He throws the airplane straight, he throws the airplane down. His evolving idea action, on the other hand, is hidden. It exists as a thought in his mind. It is not known until he is willing to share it.

Thus, the generating data action will always be observable. The evolving idea action is concealed until the holder decides to share it.

This characterization of inquiry is not meant to imply that each person always initiates his inquiry by messing with things and then moves on to ideas. Inquiry may be motivated either by data or by an idea. There are multiple entry points and departure points in the data-theory cycle. Some people begin with ideas and then move to generating data, while others may consider an idea for a long time before generating data. On the other hand, some generate much data before ideas emerge.

To inquire is to move between data and ideas. As one moves about the data-theory cycle, his personal meaning begins to grow. This is illustrated in the diagram below.



Use of a theory(ies) to build an explanation which serves to resolve the original problem focus:

"The airplane flys well."

Possible emergence of new focus:

"Can I make it turn a loop?"

Leading to reinitiation of inquiry

SPECIFIC INQUIRER ACTIONS

Handout 5.1

From the two general classes of inquiry action, Generating Data and Evolving Ideas, both Suchman and Strasser* have identified specific inquirer behaviors. These specific behaviors provide a system for understanding the kinds of actions the inquirer is taking on the problem event. The teacher who knows and uses the system can consistently maximize the conditions of student freedom and, at the same time, help the student analyze the degree to which his own actions are productive to him.

The system works like this:

EVOLVING IDEAS take three forms of expression

1. Analogy
2. Necessity
3. Synthesis

GENERATING DATA takes place through

4. Verification
5. Experimentation

and each of the above actions is performed on one or more of the following SUBJECTS

Events
Objects
Conditions of Objects
Properties of Objects

In his intuitive exploration of the problem event, the inquirer also asks a

6. Problem Focus Question

and makes a

7. Theoretical Data Statement

These seven behaviors identify the kinds of productive actions that inquirers take when building personal meaning or solving problems. Although some behaviors can be more productive than others, depending upon the needs of the inquirer and his own awareness of the range of actions available to him, all are significant actions for building and testing ideas.

It is true that inquirers behave in ways other than those described here. Some of these other behaviors are not necessarily unique to inquiry activity and others have not been understood or conceptualized as clearly as those presented here. For the time, these seven behaviors are the most useful tools we have for understanding what the inquirer is doing and for having him understand what he is doing. However, the task of describing and conceptualizing inquirer behavior is a continuous and cumulative one.

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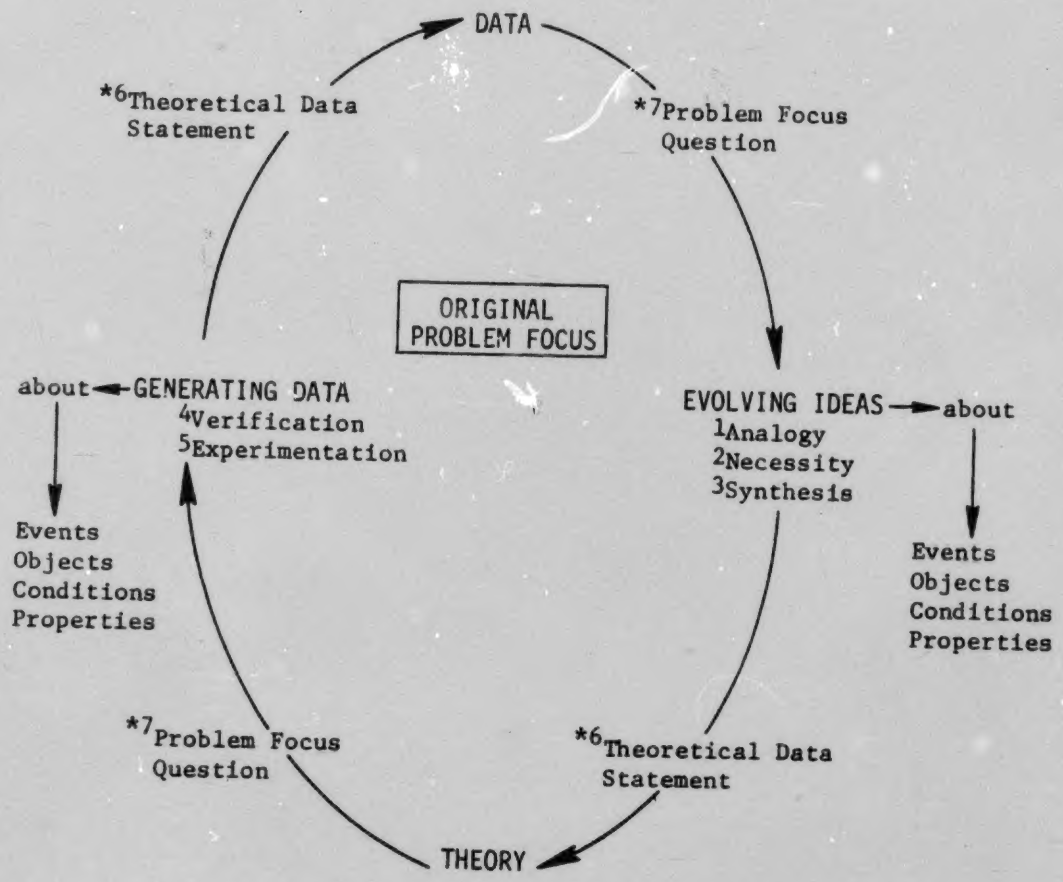
*Strasser, Ben B. "Inquirer Behavior Series." December 1968. (Mimeo)

If these seven behaviors are placed on the Inquirer Data-Theory Cycle, it would look something like the following:



*These actions actually could and do occur any place within the cycle.

On the following pages you will find descriptions of these seven behaviors. First, read the description of the behavior and then read the student actions which are examples of the behavior being described. Try to fix in your mind the student behavior being described by the labels Analogy, Necessity, Synthesis, etc. Under the heading COMMENTS you will find theoretical statements concerning the use and value of the operations to the inquirer.

ANALOGY OPERATION

Description	Student Action
Explaining why something happens in the problem event by comparing it to (1) an object or (2) an event that he knows. The analogy operation may occur as (a) a question or (b) a statement	(1a) "Does that pulse glass work like a thermometer?" (1b) "That pulse glass works like a thermometer." (2a) "Does that thing work like an egg timer when you turn it over and the sand moves?" (2b) "That thing works like an egg timer when you turn it over and the sand flows."

COMMENTS:

An analogy is a useful way of getting hold of an idea or a theory.* The analogy, which really serves as a model, can be checked against the event for likeness and difference. This checking, or analysis, leads to an identification of variables within the problem event. Thus from the analogy statement the student must move to generating data about the event to see if the analogy applies. The student expressing the analogy statement in question form, i.e., "Does the pulse glass work like a thermometer?" must decide for himself if this is the case. He therefore must use his knowledge of the thermometer to check on the pulse glass event, e.g., "Is there mercury in the pulse glass?"

*The word THEORY is used rather loosely and is intended to be synonymous with IDEA or EXPLANATION. It is simply a word that covers the range of idea patterns that are used to account for empirical events. The important distinction to be made is the one between the abstract idea, the theory, and those things which go to make up the concrete event, the data.

*NECESSITY OPERATION

Description	Student Action
Explanation identifying one variable of the problem event as the cause. The single variable may be (1) an event, (2) an object, (3) condition of an object, or (4) property of an object. The necessity operation may occur as (a) a question or (b) a statement	(1a) "Did it move because he put his hand on it?" (1b) "It moved because he put his hand on it." (2a) "Did it have anything to do with the red stuff?" (2b) "It moved because of that red stuff." (3a) "Did heat cause it to do that?" (3b) "Heat caused it to move." (4a) "Is it necessary to have a low boiling liquid to make it go?" (4b) "You have to have a liquid with a low boiling point to make it move."

COMMENTS:

A necessity idea is another useful way of theorizing. It means the inquirer has some idea about what is of consequence in the problem event. Necessity ideas, since they contain a single variable, can be checked out very readily. For example, the inquirer's idea is that it's the hand that makes it go. He can check this out by placing something else on the pulse glass to see if his theory predicts accurately. The student sharing a necessity idea in question form finds that it is his role to determine if the variable he has selected is of consequence.

*The word necessity was used by Dr. Suchman because, in effect, the inquirer is asking or saying that it is necessary for one variable to be present if the event is to be replicated.

SYNTHESIS OPERATION

Intent	Student Action
Explanation of the problem event identifying the casual relationship between two or more variables. The variables being related to the original event may include (1) objects, (2) properties of objects and (3) conditions of objects. The synthesis operation may occur as (a) a question or (b) a statement.	(a) "Does the heat (1) make the liquid warm (3) and change it to a gas because liquids when heated vaporize (2) which pushes the liquid over (3)?" (b) "I think the hand (1) has heat because body heat is usually 98.6 degrees (2) The warm hand (3) heats the liquid (3). This causes the liquid to vaporize because most liquids vaporize when they are heated (2). The vapor creates a pressure in the closed glass (2) and pushes on the liquid (3)."

COMMENTS:

A synthesis idea has application outside the original problem event from which it was derived. If well developed and tested it can be used to predict in new situations and control new events because it takes into account the casual relationships involved. For example, if the theory about the pulse glass is based on temperature causing liquids to evaporate and on the idea that different liquids vaporize at different temperatures, one could use the pulse glass theory to predict how fast the water in the swimming pool is likely to evaporate in the summer or to control the vaporization of glue by keeping the cap on. The student synthesizing in question form finds that his role is to determine if the relationships he describes do actually exist. This requires testing and checking of all the variables involved.

VERIFICATION OPERATION

Description	Student Action
Confirming something about the original problem event as it was presented, explained to have happened or as it was witnessed. Inquirers confirm (1) the total event itself, (2) objects within the event, (3) conditions of objects within the event, or (4) properties of objects within the event. Verification also includes (5) MEASURING objects, properties or conditions of objects within the event as a means of quantifying something.	(1) "Did you hold your hand on the ball on your right and after five seconds did the red liquid move to the left?" (2) "Was the red liquid mercury?" (3) "Was the red liquid at about room temperature before you grabbed the ball?" (4) "Does the kind of glass of which the balls are made conduct heat faster than say, window glass?" (5) "If you put a barometer in the right hand ball before you grabbed it, would it read less than a barometer just placed in the room?"
The operation can be performed (a) verbally, by asking someone, (b) physically by direct observation or measurement, or (c) indirectly by consulting pictures, books, records, etc.	(a) Above actions would apply if asked of a teacher, another student, resource person, computer. (b) Student gets up close to pulse glass to see if he can see some "air." (c) Student goes to an encyclopedia to find the boiling point of alcohol.

COMMENTS:

The verification action is a useful tool for building and testing ideas and for deriving personal meaning. At best, it provides the inquirer with raw data for ideas. If nothing else, the action gives him something to go on. Inquirers learn that the subjects of verification operations determine the type of data yield. For example, it may be important to know how the automobile accident took place, in which case the subject of the verification action is the event. On the other hand, it may be important to know the temporary state of the driver during the accident. Now the subject of the verification action is the condition of the driver.

EXPERIMENTATION OPERATION

Description	Student Action
Changing something in the original problem event to confirm what would happen under the newly created condition. Inquirers may seek to change (1) the event itself, (2) object in the event or (3) conditions of objects in the event. NOTICE: The key to the experimentation operation is that the inquirer changes something in the original problem event. You must have an original problem event before you can experiment.	(1) "If instead of doing what you did,you held the glass vertical and put your hand on the lower ball, would the liquid go into the upper ball just as fast as it moved before?" (2) "If you used ether in the glass instead of the red liquid that's in there, would it move in the same way?" (3) "If you placed your hand in a pan of ice water for a minute just before you held the ball the first time, would it take longer for the liquid to move?"
The operation can be performed (a) verbally, by asking someone or (b) physically by directly manipulating some variable within the event.	(a) The above examples would apply if students had asked these of teacher, another student, other resource person, computer, etc. (b) Student has observed the original pulse-glass problem event and has been handed a pulse glass by the teacher. The student gets an ice cube and places it on one of the balls to observe what happens.

COMMENTS:

The experimentation action is also a useful tool for building and testing theories. It enables the inquirer to establish controls within an event to determine effects under new conditions. Like the verification action, it can have different subjects. It is sometimes difficult to perform or undesirable to perform. For example, it would be difficult and/or questionable to reproduce an automobile accident to see what would happen under different conditions; it would be difficult to control all the variables involved in the accident to find the effect of any one variable; it would be questionable for teenagers to experiment with fast driving to find out its effects.

Handout 5.1

The inquiry operations identify what students do when they evolve ideas and generate data. Suchman[1] has also identified the SUBJECTS of the operations or those things on which the inquirer operates.

1. EVENTS Any happening during the problem event, for example, the man put his hand on the right bulb of the pulse glass.
2. OBJECTS The physical, separate parts that make up the event, for example, the man's hand, the pulse glass, the red liquid, air in the room, are all objects within the event described above.
3. CONDITIONS The states of objects which change. Shape, position, speed, weight, temperature are conditions of objects which may vary at different times. For example, the man's hand was 98.6 degrees Fahrenheit, the pulse glass weighed 2 ounces, the barometric pressure of the air in the room was 30 inches. These are the conditions of the objects within the event described above.
4. PROPERTIES The main characteristics of objects which do not change with time. Objects are known and identified by their properties. For example, the human hand has a palm, four fingers, a thumb; air is an odorless, colorless mixture of mostly nitrogen and oxygen gases.

You will find examples of operations containing these subjects on the preceding sheets which describe operations.

COMMENTS:

For an inquirer, it is useful to know what to gather data about or what to build ideas about. The inquirer who is aware that he can experiment with objects, events and conditions has much greater power than an inquirer who may only experiment with objects. The inquirer who can verify properties has one of the most powerful strategies of inquiry. If one only knows the name of a strange substance or object he is not better off than he was before; but if he determines some of the properties of the substance or object he has some ability to predict its behavior and some idea of what kinds of experimentation might yield further data. For example, the knowledge that a particular liquid has a low boiling point makes possible a prediction of its behavior in many circumstances. It also suggests that conditions of temperature might be very important in determining the behavior of the liquid.

Inquirers, aware of subjects of operations, can begin to develop strategies for handling new problems. If one doesn't have a theory, how does one begin? In search of a theory, one can begin to verify events, objects, conditions and properties. Then experimenting becomes useful in determining which of the data generated is of consequence to the problem. For example, if one had no idea how to explain the pulse glass, he could just begin by finding out about the container. Determining that it was glass, he could experiment with a plastic container to see if it makes a difference. Finding that it didn't and finding that other objects used for the container didn't make a difference he could conclude (for the time) that the container was of little consequence.

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[1] Adapted from Suchman, J. Richard. Developing Inquiry. Chicago: Science Research Associates, 1966, pages 56-57.

PROBLEM FOCUS QUESTION

Handout 5.1

Description	Student Action
Question concerning a cause-effect relationship asked by the inquirer as he identifies a problem for inquiry.	(1) "Why does the stuff bubble like that?" (2) "Why does it move the other way when you put an ice cube on it?" (3) "Why doesn't it work when it's upside down?"
The question can be raised (a) in relation to an ongoing problem event, or (b) in relation to an event identified solely by the inquirer.	(a) Examples above would apply if students were working on the pulse glass problem. (b) Student comes in from the playground and asks the teacher, "Hey, how come those weeds can grow right up through the blacktop?"

COMMENTS:

Students will often raise additional questions about a problem event even after the teacher has used a focusing question to pinpoint a contrasting situation. Students continually perceive new parts of the event, find new events and raise new questions growing out of newly developed meaning. Student problem focus questions eventually want to become the basis for classroom inquiry.

THEORETICAL DATA STATEMENT

Handout 5.1

Description	Student Action
Statement of (1) an observation, (2) an assumption, (3) a belief about the problem event, or (4) an off-the-cuff prediction which seems to be more matter of fact rather than an attempt to explain the problem and is certainly not an overt attempt to generate data.	(1) "The liquid bubbled." (2) "He squeezed the glass ball." (3) "I bet the liquid is water." (4) "I think it will move when he puts a towel over the glass.

COMMENTS:

"Thinking out loud" often appears to be a prerequisite for taking action. Students will often make a statement which is neither an attempt to explain or to generate data. Soon they desire more payoff and change these statements to generating data actions.

CYCLING ORDER

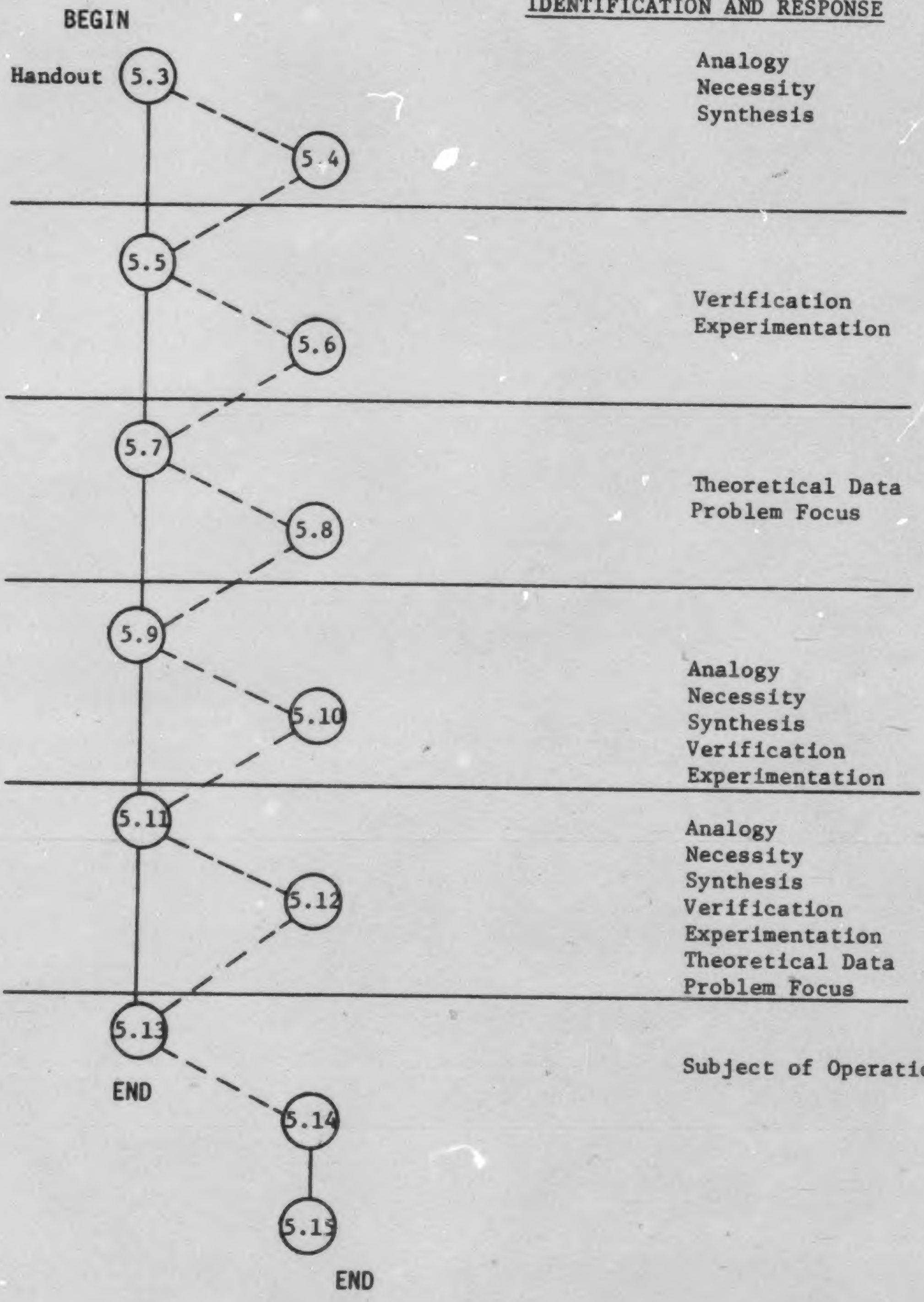
Handout 5.2

This handout gives the order in which each trio will use the various materials for this exercise. Only one set of the materials is needed in each trio.

1. Begin with Handout 5.3.
2. If the trio gets two-thirds of the items on Handout 5.3 correct, they should follow the arrow straight down the page to Handout 5.5.
3. If, however, the trio gets less than two-thirds of the items on Handout 5.3 correct, they should move diagonally, down the dotted line, to Handout 5.4. This gives them a second practice at responding to similar student actions. After completing the handout, they follow the diagonal line to Handout 5.5.
4. Thus, anytime a trio misses more than two-thirds of the items on a handout found in the straight line, they should branch to the second exercise indicated by the diagonal lines.
5. Continue through the materials, following the path which best helps the trio achieve two-thirds accuracy.

Handout 5.2

CYCLING ORDER



TYPE OF INQUIRER ACTIONS FOR IDENTIFICATION AND RESPONSE

Analogy
Necessity
Synthesis

Verification
Experimentation

Theoretical Data
Problem Focus

Analogy
Necessity
Synthesis
Verification
Experimentation

Analogy
Necessity
Synthesis
Verification
Experimentation
Theoretical Data
Problem Focus

Subject of Operations

ANALOGY, NECESSITY, SYNTHESIS
Exercise I

Handout 5.3

SET I

1. "The heat in your hand made it go."
2. "The liquid moves because you put your hand around the ball which heats the liquid and makes a gas and the gas makes it move."
3. "There is a gas in the bulbs that comes out of the red liquid when the red liquid is heated by the hand and it is the gas that does the pushing."
4. "Does that pointed tip have anything to do with it?"
5. "I think the pulse glass works like a teeter-totter."

SET II

6. "The liquid moves like that because you put your hand on it."
7. "Does the pressure of your hand warm up the ball causing a gas which pushes the red stuff over?"
8. "Will it only work if you use the liquid that is in there?"
9. "The liquid moves on the basis of heat and cold."
10. "Is the warmth from your hand making the liquid warm and the liquid is forming a gas in the ball and, so gas pushes the red liquid into the other ball?"

SET III

11. "Does a vacuum have something to do with it moving?"
12. "Does it move because the cold attracts the liquid and the heat repels it?"
13. "Do you have to slant the tube in order for the liquid to move?"
14. "Is there a certain air pressure in the glass that makes it go back and forth?"
15. "It moves like that because you squeeze it."
16. "Doesn't the pulse glass work like a percolator coffeepot?"

ANSWER SHEET
Exercise I

Handout 5.3

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET I	
1. "OK" (ACCEPTING)	NECESSITY: Only one variable, "hand" used to explain why it moves
2. "I understand your idea." (ACCEPTING)	SYNTHESIS: Causal relationship shown between hand and heat, between heat and gas.
3. "OK, you feel it is a gas that's created to push the liquid to the other side." (ACCEPTING)	SYNTHESIS: Causal relationship shown between heated hand and creation of gas. NOTE: You can see how the synthesis statement is more complex than the necessity statement in Item 1.
4. "It might. That would be your job to decide." (STRUCTURING)	NECESSITY: Only one variable given, "pointed tip." NOTE: It's the student's role to decide what is of importance. This student response is not a data probe. It is asking the teacher to confirm his idea which is not the teacher's role. Necessity questions of this type are common with students new to this role.
5. "OK." (ACCEPTING), may want to ask for clarity of teeter-totter.	ANALOGY: Student comparing the pulse glass to something he understands. The comparisons he's making aren't clear until he talks about the teeter-totter.
SET II	
6. "OK, you're saying the hand makes it move." (ACCEPTING)	NECESSITY: Only one variable involved in the idea. NOTE: This explanation does little more than describe what happened in the event. Young children do this because they talk in concrete terms.

Answer Sheet
Exercise I

Handout 5.3

SET II

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
7.	"That's up to you to decide." (STRUCTURING)	SYNTHESIS: Relating warm hand and gas. Again, student is expressing his idea in question form, asking the teacher for confirmation. The teacher lets him know that he must decide for himself.
8.	"You're going to have to decide that." (STRUCTURING)	NECESSITY: Only one variable, "liquid" involved. NOTE: This is where the term necessity originated. The student is really asking "In order for that thing to work, is it NECESSARY to use that liquid?"
9.	"You feel that temperature causes the liquid to move. OK." (ACCEPTING)	NECESSITY: Really only one variable given here, "temperature."
10.	"That's up to you to decide." (STRUCTURING)	SYNTHESIS: Warm hand causes gas which causes pushing.

SET III

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
11.	"That's up to you to decide." (STRUCTURING)	NECESSITY: Only one variable, "vacuum," involved as the cause.
12.	"You'll have to decide that." (STRUCTURING)	NECESSITY: Only one variable, "temperature," involved. It would be a synthesis operation if he had linked either hot or cold causing something else to happen. Here, he only relates it to having the liquid move. Hence, only one variable.
13.	"You'll have to decide that." (STRUCTURING)	NECESSITY: Only one variable, "position of the tube," involved.
14.	"You'll have to decide that." (STRUCTURING)	NECESSITY: Only one variable, "air pressure," involved in the idea. Again, this is not a data probe operation. It is a student asking for confirmation of his idea. It is not the teacher's role to confirm ideas.

Answer Sheet
Exercise I

Handout 5.3

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET III	
15. "OK." (ACCEPTING)	NECESSITY: Only one variable, "squeezing," involved.
16. "Could be, but you'll have to decide." (STRUCTURING)	ANALOGY: Student is comparing the pulse glass with an object he knows. NOTE: Teacher can attempt to clarify what student means by coffeepot.

ANALOGY, NECESSITY, SYNTHESIS
Exercise II

Handout 5.4

SET I

1. "The liquid moves because the pulse glass works like a magnet."

2. "The heat of the hand makes the vapor in the bulb expand. But the vapor can only expand so far before it starts pushing on something. The easiest thing for it to push on is the liquid. So the expanding vapor pushes the liquid over."

3. "Does the stuff move because it runs toward the light?"

4. "When you hold your hand on the ball it gets hot inside forcing the liquid over to the other side."

5. "When you put your hand on the bulb, the heat from your hand goes in that bulb and builds up pressure and the pressure pushes it over to the other bulb."

SET II

6. "When you hold it in your hand, does it get hot inside the bulb you're holding while the other bulb stays cold, forcing the red liquid to go to the cold side?"

7. "When you put your hand on it and the heat from your hand goes in that little ball, does it build up pressure and make it push over to the other ball?"

8. "Do you have to use that size of ball?"

9. "Another reason why the liquid moves so quickly is because of its low boiling point."

10. "The pulse glass works like that collapsing can experiment."

11. "Do the molecules of the gas expand so fast that they just make the liquid go over?"

SET III

12. "Does it move along like that because of pressure?"
13. "It moves like that because you squeeze that little tip."
14. "Does it have anything to do with the heat in your hand?"
15. "Does your hand have to be warm before it works?"
16. "Does it matter how cold your hand is?"

ANSWER SHEET
Exercise II

Handout 5.4

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET I		
1.	"OK, I understand." (ACCEPTING) May want to clarify what student means by magnet.	ANALOGY: Student explaining movement of liquid by comparing it to something he knows.
2.	"OK, I understand your theory." (ACCEPTING)	SYNTHESIS: Student explanation containing the relationship of the condition of the hand to vapor expanding and the property of a vapor.
3.	"You see it's your role to decide why it runs." (STRUCTURING)	NECESSITY: Student asking teacher to confirm if the variable "light" is of consequence.
4.	"OK, I understand." (ACCEPTING)	SYNTHESIS: Explanation relating hand to ball getting hot and liquid moving.
5.	"Sure, I understand your idea." (ACCEPTING)	SYNTHESIS: Student sharing an idea containing a causal relationship between hand, heat and pressure, then asking the teacher to confirm it.
SET II		
6.	"Your role is to decide why the liquid moves. If that idea makes sense to you now, fine." (STRUCTURING, ACCEPTING)	SYNTHESIS: Student sharing an idea where he has related the hand to heat and pressure.
7.	"You're going to have to decide that." (STRUCTURING)	SYNTHESIS: Student sharing a theory which relates the hand to heat to pressure and asking the teacher to confirm it.
8.	"You will have to decide that." (STRUCTURING)	NECESSITY: Student has an idea involving one variable, "size of ball." He is asking for confirmation of his idea, i.e., "Is it necessary to use that size ball?"

Answer Sheet
Exercise II

Handout 5.4

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET II	
9. "OK." (ACCEPTING)	NECESSITY: Student explaining the movement of the liquid through a single variable, a property of the liquid.
10. "OK, but what do you mean 'like the collapsing can experiment?" (ACCEPTING, CLARIFYING)	ANALOGY: Student is explaining the behavior of the pulse glass by comparing it to something he knows.
11. "It's your role to decide what makes the liquid go over." (STRUCTURING)	NECESSITY: Student using one variable, condition of molecules, to explain the moving liquid, and asking teacher to confirm it.
SET III	
12. "You will have to decide that." (STRUCTURING)	NECESSITY: Student asking for confirmation of his idea which contains the single variable, pressure.
13. "OK, I understand." (ACCEPTING)	NECESSITY: Student sharing an idea involving a single variable.
14. "You'll have to decide that." (STRUCTURING)	NECESSITY: Student explaining the event using the single variable of heat and asking teacher to confirm it.
15. "You'll have to decide that." (STRUCTURING)	NECESSITY: Student wants confirmation of a single variable, "warmth," which he feels is cause of liquid moving.
16. "You'll have to decide that." (STRUCTURING)	NECESSITY: Same as above.

VERIFICATION, EXPERIMENTATION
Exercise I

Handout 5.5

SET I

1. "Do those glass balls have any holes in the top?"
2. "If I was to cut a hole in a piece of cardboard and put one of the bulbs through the hole so that there would be bulbs on each side of the cardboard, and if I put heat on one of the bulbs so that the heat wouldn't get to the other bulb, would the liquid still go to the other bulb?"
3. "Did the red liquid have any kinds of metals in it?"
4. "If you use water with food coloring in the pulse glass instead of the liquid that's in there, would it do the same thing?"
5. "If I put cold on both sides instead of a hand on one side, would the liquid stay in the middle?"

SET II

6. "Did the liquid run through the tube between the balls like a hose or does it just stick to the sides of the tube?"
7. "Is that colored water in there?"
8. "Can air get in the glass?"
9. "Does air have weight?"
10. "Does air have pressure?"
11. "Can the chemical that's in the glass eat through wood?"

SET III

12. "If you got one hand cold and the other hand hot and grabbed the glass with both hands, would the red liquid move faster than it did when you first grabbed it with one hand?"
13. "Did the liquid go up into the other ball?"
14. "If you put the glass in the freezer for two hours and then took it out and grabbed one of the balls, would the red liquid move?"
15. "If you put air in the glass and then did what was done at the first demonstration, would the red liquid still move?"
16. "If instead of putting your hand over the ball you put a heavy piece of cloth, would the red stuff still move?"
17. "If you did the same demonstration except in a place where there was not gravity, would the red liquid still move?"

ANSWER SHEET
Exercise I

Handout 5.5

SET I

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
1. "No." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming the condition of the pulse glass.
2. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Changing the original event by placing a cardboard between the two bulbs to see if the same thing would take place.
3. "No." (RESPONDING TO DATA PROBE) Clarifying may be felt by some to be necessary, i.e., "What do you mean by metals in the liquid?"	VERIFICATION: Confirming the liquid object itself or the condition of the liquid.
4. "No." (RESPONDING TO DATA PROBE) Clarification might be used to see if everything in the student's experiment would remain except the liquid because under some conditions different from those in the original event, water could work.	EXPERIMENTION: Changing the object in the pulse glass to see what would happen with a new liquid.
5. "Yes, probably." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Changing the original event by creating a new event to see what would happen.

SET II

6. "It ran through the tube like a hose." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming what took place in the event or confirming the condition of the running liquid.
7. "No." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming the object in the pulse glass.

Answer Sheet
Exercise I

Handout 5.5

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET II		
7.		NOTE: The pulse glass problem demonstrates the limitations of performing operations on OBJECTS. Students find out that when they get the name of the OBJECT, Methylene Chloride, they don't know much. What they really want to know are the properties of the stuff.
8.	"No." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming the condition of the pulse glass.
9.	"Yes." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming a property of air.
10.	"Yes." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming a property of air.
11.	"No." (RESPONDING TO DATA PROBE) The teacher may want to clarify, i.e., "Do you mean if you put some of the liquid on a wooden table top, would it make a hole?"	VERIFICATION: Confirming a property of liquid.
SET III		
12.	"Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Revising the original event by creating a new event or adding a new object, "cold hand."
13.	"Yes." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming an event; seeing if something really took place.
14.	"Not much." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Confirming what would happen with the pulse glass under new conditions; a condition that didn't exist in the original event.

Answer Sheet
Exercise I

Handout 5.5

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET III	
15. "No." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Changing the original event by adding an object, "air," to the pulse glass and seeing what would happen under new conditions. This also might be viewed as changing the condition of the pulse glass.
16. "Yes, it could." (RESPONDING TO DATA PROBE) Teacher may want to seek clarity on just what is meant by, "putting a piece of heavy cloth on it."	EXPERIMENTATION: Substituting a piece of cloth in place of a hand to see the results.
17. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Substituting a new event, nongravity, to see what would happen under conditions different from the original event.

VERIFICATION, EXPERIMENTATION
Exercise II

Handout 5.6

SET I

1. "Did you tip it when you did the demonstration or did you hold it level?"

2. "Is the one ball larger than the other ball?"

3. "If you hold it upside down so that both balls are down on the bottom and if you grab one ball, will the liquid move to the other ball?"

4. "Is there air in the pulse glass?"

5. "Does air have color?"

SET II

6. "Is that the natural color of the chemical?"

7. "If you were to take that tip off the glass, would it still work?"

8. "If you put a match on one side and an ice cube on the other side, would the liquid go to the side with the ice cube?"

9. "If you did the same demonstration in a completely dark room would it still work the same way?"

10. "If you did the same thing in a room that was 30 degrees colder would it still work in the same way?"

SET III

11. "If, instead of having the amount of liquid we have in the glass now, we had twice as much, would it still work in the same way?"

12. "If I were to put a very small hole in top of one of the balls and grabbed the ball with my hand, would the red liquid still move?"

13. "If instead of just putting one hand on a ball, you put one hand on a ball and the other hand on the tube between the balls, will the red stuff still move?"

14. "If instead of grabbing the ball he had of blown on it, would the liquid still move?"

15. "If you were to put mercury in the glass instead of what's in there, would it work the same way?"

ANSWER SHEET
Exercise II

Handout 5.6

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET I	
1. "I held it level." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming the position of the glass in the original event.
2. "No, both the same size." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming the condition of the bulbs.
3. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating a new event, or this might be viewed as changing the condition (position) of the glass.
4. "A very little." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming the presence of an object, "air."
5. "No." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming a property of air.
SET II	
6. "Yes." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming a property of the liquid.
7. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the condition of the pulse glass from the original event.
8. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by manipulating the objects held on the pulse glass to see what would happen under new conditions.
9. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating a new environment or condition in which event takes place to see what will happen.

Answer Sheet
Exercise II

Handout 5.6

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET II	
10. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating new environmental conditions.
SET III	
11. "No." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student manipulating original event by changing the condition of the liquid to see what would happen.
12. "No." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by altering the condition of one of the bulbs.
13. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating another event (hand grabbing tube) to see the effect.
14. "Yes, probably would." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating a new event, "blowing."
15. "No." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing original problem event by manipulating an object, the liquid.

PROBLEM FOCUS, THEORETICAL DATA
Exercise I

Handout 5.7

SET I

1. "Why doesn't it flow as quickly to one side as to the other side?"
2. "It could be water in there."
3. "I think there may be an acid in there."
4. "I notice that sometimes when you grab it the liquid doesn't move."
5. "Why doesn't the liquid move when the glass is upside down?"
6. "Why does the liquid go down, across and then up?"

SET II

7. "Why does it bubble when you put your hand on one side and it is going to the other side?"
8. "There's a chemical in there."
9. "When you put your hand on it it bubbled."
10. "It seems to work at one temperature but not at another."
11. "Maybe something inside the red liquid expands."
12. "All of the liquid is in one bulb."

SET III

13. "It looks like blood."
14. "Why is it that the liquid can run uphill?"
15. "How come some liquids feel cooler on your hand than others?"
16. "How come you can't see gasses?"
17. "Why won't it work when you use only half as much liquid?"

ANSWER SHEET
Exercise I

Handout 5.7

SET I

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
1. "That's another problem you may want to work on. (FOCUS SETTING) NOTE: The teacher's role is to make it legitimate for students to pursue their own identified problems.	PROBLEM FOCUS: Student identifying a problem for inquiry by raising a cause-effect question, i.e., "What causes it to flow differently?"
2. "Yes, there sure could be." (ACCEPTING)	THEORETICAL DATA: Student sharing an observation or assumption. NOTE: This indicates involvement on the part of the student. It doesn't get him data. It doesn't indicate if or why water is important.
3. "OK." (ACCEPTING) NOTE: "OK," means "I understand, I accept your statement." It doesn't mean "Yes," or "I agree" or "That's right."	THEORETICAL DATA: Student sharing a thought, an assumption.
4. "I noticed that too." (ACCEPTING)	THEORETICAL DATA: Student sharing an observation. NOTE: Had the student asked "why," this would have been a problem focus question on the part of the student.
5. "Another problem to consider." (FOCUS SETTING)	PROBLEM FOCUS
6. "Yeah, why?" (FOCUS SETTING)	PROBLEM FOCUS NOTE: Items five and six are not data probes by students. They are asking for explanations. It is the student's role to develop his own explanation.

Answer Sheet
Exercise I

Handout 5.7

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET II	
7. "You might want to work on that for awhile." (FOCUS SETTING)	PROBLEM FOCUS: Student asking for cause of bubbling.
8. "OK." (ACCEPTING)	THEORETICAL DATA: Student sharing an assumption. NOTE: Students rather quickly realize there is little payoff from a theoretical data statement.
9. "Uh, huh." (ACCEPTING)	THEORETICAL DATA
10. "Uh, huh." (ACCEPTING)	THEORETICAL DATA
11. "Maybe." (ACCEPTING)	THEORETICAL DATA NOTE: Changing the statement to a question gets data, e.g., "Does something inside the liquid expand?" Students find this out on their own.
12. "OK." (ACCEPTING)	THEORETICAL DATA
SET III	
13. "Uh huh." (ACCEPTING)	THEORETICAL DATA
14. "Yes, why is it that some liquids can run uphill?" (FOCUS SETTING)	PROBLEM FOCUS: Student identifies his own problem for inquiry.
15. "Yeah, how come?" (FOCUS SETTING)	PROBLEM FOCUS NOTE: With students providing their own problem focus, the teacher's role of providing problem events and focusing questions will diminish. He might begin the transition by continuing to provide events but allowing students to provide their own focusing questions.

Answer Sheet
Exercise I

Handout 5.7

SET III

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
16.	"Interesting idea. How come?" (FOCUS SETTING)	PROBLEM FOCUS: Student asking, "What causes gasses not to be seen?" Problem focus questions don't have to begin with a "why."
17.	"There's another problem we haven't dealt with. Yes, how come?" (FOCUS SETTING)	PROBLEM FOCUS

PROBLEM FOCUS, THEORETICAL DATA
Exercise II

Handout 5.8

SET I

1. "Heat rises."
2. "His pulse is beating fast."
3. "Heat has a tendency to rise."
4. "I guess there was pressure from your hands."
5. "There is gas in there."

SET II

6. "The air has to go out and the liquid has to go in."
7. "The liquid might go to the top."
8. "I think those are air bubbles."
9. "It seems to move only from left to right."
10. "Why is all the liquid in one bubble?"

SET III

11. "Why does it boil like that?"
12. "Why wouldn't the liquid move if there was air in there?"
13. "Why doesn't the liquid run up when you hold it vertical?"
14. "Why does glass conduct heat faster than plastic?"

ANSWER SHEET
Exercise II

Handout 5.8

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET I		
1.	"I understand." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief.
2.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief or an observation.
3.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief.
4.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief or an observation.
5.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief.
SET II		
6.	"OK." (ACCEPTING) May plan to clarify if student is just thinking out loud or if this is his reason for the liquid moving, e.g., "Are you saying this is why the liquid moves?"	THEORETICAL DATA: Student sharing a belief. This might also be a NECESSITY OPERATION if this is his reason for the liquid moving.
7.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing an off-the-cuff prediction.
8.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief or an observation.
9.	"Hmm." (ACCEPTING)	THEORETICAL DATA: Student sharing an observation.
10.	"Interesting question, 'Why is it all in one bubble?'" (FOCUS SETTING)	PROBLEM FOCUS: Student raising a question asking for causal explanation.

Answer Sheet
Excercise II

Handout 5.8

SET III

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
11.	"Yes, why does it boil like that?" (FOCUS SETTING)	PROBLEM FOCUS: Student identifying his own problem for inquiry.
12.	"Yes, why wouldn't it?" (FOCUS SETTING)	PROBLEM FOCUS: Student identifying a problem for inquiry. Question is asking for explanation of cause.
13.	"Yeah, interesting question, 'Why doesn't it run up?'" (FOCUS SETTING)	PROBLEM FOCUS: Same as above.
14.	"Yes, why does it?" (FOCUS SETTING)	PROBLEM FOCUS: Student finding his own problem for inquiry. Question asks for explanation of cause.

VERIFICATION, EXPERIMENTATION, ANALOGY,
NECESSITY, SYNTHESIS
Exercise I

Handout 5.9

SET I

1. "It moves because you have just the right amount of heat."
2. "If, instead of putting a hand on one ball, I put heat on one ball and cold on the other ball, would it go to the one that is colder?"
3. "When you put your hand on the ball does the red liquid heat up a little to give off a gas which forces the ball to fill up with gas, forcing the liquid into the other ball?"
4. "Is that a chemical in there?"
5. "Is that sulfuric acid in there?"

SET II

6. "It's the heat that makes it move, the heat from your hand."
7. "The pulse glass is like a heart pushing blood."
8. "Doesn't it move because the heat of your hand makes the red liquid vaporize so that it pushes out, and the vapor builds up until it can't go out anymore because of the pressure, so it pushes the liquid over?"
9. "If you did what you did the first time to make the liquid move, but when it starts moving, if you were to grab the tube between the two balls, would the liquid stop moving?"
10. "Does the thing work by the heat of your hand?"

SET III

11. "If your hand had no heat at all and you put it on one of the bulbs, would it work the same way?"
12. "If I put the glass in a refrigerator would the red liquid freeze?"
13. "Air makes it move like that."
14. "If you did the same thing in a room that was 30 degrees hotter, would it still work the same way?"
15. "The liquid moves because the heat repels it, pushes it away."

ANSWER SHEET
Exercise I

Handout 5.9

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET I	
1. "OK, I understand your idea. (ACCEPTING)	NECESSITY: Student explanation of why the liquid moved containing one variable, "amount of heat."
2. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Changing the original event by creating a new event involving a cold object and a hot object.
3. "Well, you'll have to decide if that's why the liquid moves. It's not my role to say if that idea is right or wrong." (STRUCTURING)	SYNTHESIS: Student sharing an idea which contains more than one variable, showing how one variable affects another.
4. "Yes." (RESPONDING TO DATA PROBE) May want to clarify the term chemical, i.e., "What do you mean when you say chemical?"	VERIFICATION: Confirming the object in the pulse glass.
5. "No." (RESPONDING TO DATA PROBE)	VERIFICATION: Confirming the object in the pulse glass.
SET II	
6. "OK." (ACCEPTING)	NECESSITY: An explanation or theory containing one variable, i.e., the condition of the human hand or the object, heat.
7. "OK." (ACCEPTING) May want to probe, e.g., "I don't understand what you mean, 'like a heart pumping blood.' Can you clarify that for me?"	ANALOGY: Student comparing pulse glass to the heart.
8. "You're going to have to decide if that makes sense. It isn't my job to say if an idea is good or bad." (STRUCTURING)	SYNTHESIS

Answer Sheet
Exercise I

Handout 5.9

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET II		
9.	"No." (RESPONDING TO DATA PROBE)	EXPERIMENT: Student changing the original event by creating a new event, i.e., having someone grab the tube between the two balls when the liquid starts to move.
10.	"It's your job to decide why it works that way." (STRUCTURING)	NECESSITY: Student sharing an explanation with one variable, the condition of the hand or the object heat.
SET III		
11.	"No." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Changing the condition of the hand from the original event.
12.	"No." (RESPONDING TO DATA PROBE) May want to clarify what the student means by refrigerator, i.e., how cold is he talking about?	VERIFICATION: Confirming the property of the liquid, i.e., its freezing point. NOTE: This is not an experiment. An experiment always has to do with changing something in the original event. This has nothing to do with the original event. The student has chosen a unique way to inquire into the properties of the liquid. He could have asked, "At what temperature does this liquid freeze?"
13.	"OK, I understand your idea." (ACCEPTING)	NECESSITY: One variable, an object, air, is used to explain the cause.
14.	"No, probably not the same way." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Changing the original event by altering the condition of the room.
15.	"OK." (ACCEPTING)	NECESSITY: A student sharing an idea using the object, heat, to explain the cause.

VERIFICATION, EXPERIMENTATION, ANALOGY, NECESSITY, SYNTHESIS
Exercise II

Handout 5.10

SET I

1. "Does a gas affect the pulse glass in any way?"

2. "The man's pulse is what makes it go."

3. "Does it move because one side is hot and the other side is cold?"

4. "If you held the glass up and down instead of horizontal and held one of the bulbs, would the liquid go up into the other bulb?"

5. "The boiling point of the liquid is around 65 degrees. The man's hand is 98.6 degrees so the hand causes the liquid to boil. The boiling causes vapor, like steam from a tea kettle, and the increasing vapor causes pressure. The pressure pushes the red liquid over."

SET II

6. "Does the color of the liquid have something to do with the liquid moving?"

7. "Does pressure have more to do with the liquid moving than heat?"

8. "If you put hands on both bulbs would the liquid just stay still?"

9. "If you put a heating pad on one side of the glass instead of your hand would the red liquid move?"

10. "Is there any air pressure inside the glass?"

SET III

11. "How thick is the pulse glass?"

12. "My theory is, when you put your hand on the ball you increase the pressure of the air in there which tends to push the ball out and push the red liquid over to the other ball. Pressure is increased because that liquid vaporizes at a very low point."

13. "Doesn't that work like a thermometer?"

14. "If you were to make the tube between the balls 2 inches shorter, would it still work the same way?"

15. "If, instead of having the amount of red liquid we have in the glass now, we had only one-half the amount, would the demonstration work in the same way?"

ANSWER SHEET
Exercise II

Handout 5.10

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET I		
1.	"You will have to decide that." (STRUCTURING)	NECESSITY: Student has an idea that gas is necessary or important. He is asking for confirmation of his idea. The teacher doesn't confirm ideas, this is the student's role.
2.	"OK, I understand your idea." (ACCEPTING)	NECESSITY: Student expressing an idea containing one variable, "man's pulse."
3.	"You see it's your job to decide why it moves. I'm here to provide information that you request, but not to decide for you." (STRUCTURING)	NECESSITY: Only one variable mentioned here, "temperature." The idea is being stated as a question, asking for teacher confirmation.
4.	"Not right away." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Changing the original event by manipulating the position of the glass to see what would happen under the new condition.
5.	"OK, I understand your theory." (ACCEPTING)	SYNTHESIS: Student sharing an idea involving the relationship of property of liquid to man's hand to condition of gas.
SET II		
6.	"You will have to decide that." (STRUCTURING)	NECESSITY: Student asking the teacher to confirm his idea that one variable, "color," is necessary.
7.	"That's up to you to decide." (STRUCTURING)	NECESSITY: Student has an idea that both variables are important but is asking the teacher to confirm which. It is not a synthesis operation because student has not linked two or more variables to relate cause.
8.	"Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating a new event or it may be considered adding a new object "a hand."

Answer Sheet
Exercise II

Handout 5.10

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET II		
9.	"Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Manipulating a variable, "object placed on the glass," to see what would happen.
10.	"Yes, a very little." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming the condition of the inside of the pulse glass.
SET III		
11.	"About 1/32." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming condition of the pulse glass.
12.	"OK. Your idea is that the hand causes an increased pressure inside the glass." (ACCEPTING)	SYNTHESIS
13.	"You'll have to decide that." (STRUCTURING) May want to clarify, e.g., "What do you mean, 'like a thermometer?'"	ANALOGY: Student comparing pulse glass to something he knows.
14.	"Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by manipulating the condition of the tube to see what would happen.
15.	"Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by manipulating the condition, amount, of liquid.

VERIFICATION, EXPERIMENTATION, ANALOGY, NECESSITY, SYNTHESIS, PROBLEM FOCUS, THEORETICAL DATA
Exercise I

SET I

1. "Heat rises."

2. "Did you tip it when you did the demonstration or did you hold it level?"

3. "If you hold it upside down so that both balls are down on the bottom, and if you grab one ball, will the liquid move to the other?"

4. "The liquid moves because the pulse glass works like a magnet."

5. "His pulse is beating fast."

6. "The heat of the hand makes the vapor in the bulb expand. But the vapor can only expand so far before it starts pushing on something. The easiest thing for it to push on is the liquid. So the expanding vapor pushes the liquid over."

SET II

7. "Is there air in the pulse glass?"

8. "There is a gas in there."

9. "If you put a match on one side and an ice cube on the other, would the liquid go to the side with the ice cube?"

10. "When you hold your hand on the ball, it gets hot inside, forcing the liquid over to the other side."

11. "Why is all the liquid in one bubble?"

SET III

12. "Why does it boil like that?"

13. "When you put your hand on the bulb, the heat from your hand goes in that bulb. It builds up pressure and the pressure pushes the liquid over to the other bulb."

14. "If, instead of having the amount of liquid we have in the glass now, we had twice as much, would it still work in the same way?"

15. "Do you have to use that size ball?"

16. "The liquid moves because you squeeze the little tip."

ANSWER SHEET
Exercise I

Handout 5.11

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
SET I		
1.	"I understand." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief.
2.	"I held it level." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming the position of the glass in the original event.
3.	"Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating a new event, or, this might be viewed as changing the condition, position, of the glass.
4.	"OK, I understand." (ACCEPTING) May want to clarify what student means by magnet.	ANALOGY: Student explaining movement of liquid by comparing it to something that he knows.
5.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief or an observation.
6.	"OK, I understand your theory." (ACCEPTING)	SYNTHESIS: Student explanation containing the relationship of the condition of the hand to vapor expanding and the property of a vapor.
SET II		
7.	"A very little." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming the presence of an object, "air."
8.	"OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief.
9.	"Yes." (RESPONDING TO DATA PROBE.)	EXPERIMENTATION: Student changing the original event by manipulating the objects held on the glass to see what would happen under new conditions.
10.	"OK, I understand, you feel it's the heat that pushes the liquid to the other side." (ACCEPTING)	SYNTHESIS: Student sharing an idea where he has developed a relationship between the hand and heat developing in the glass, i.e., "The hand causes heat and the heat pushes the liquid over."

Answer Sheet
Exercise I

Handout 5.11

SET II

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
11.	"Interesting question, 'Why is it all in one bubble?'" (FOCUS SETTING)	PROBLEM FOCUS: Student raising a question asking for causal explanation.

SET III

	Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
12.	"Yes, why does it boil like that?" (FOCUS SETTING)	PROBLEM FOCUS: Student identifying his own problem for inquiry.
13.	"OK." (ACCEPTING)	SYNTHESIS: Student developing causal relationship between condition of hand, property of glass, conduction, and condition of the liquid to see what would happen.
14.	"No." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student manipulating original event by changing the condition of the liquid to see what would happen.
15.	"You will have to decide that." (STRUCTURING)	NECESSITY: Student has an idea involving one variable, "size of ball." He is asking for confirmation of his idea, i.e., "Is it necessary to use that size ball?"
16.	"OK, I understand." (ACCEPTING)	NECESSITY: Student sharing an idea involving a single variable.

VERIFICATION, EXPERIMENTATION, ANALOGY, NECESSITY, SYNTHESIS, PROBLEM FOCUS, THEORETICAL DATA
Exercise II

Handout 5.12

SET I

1. "The liquid might go to the top."

2. "I think those are air bubbles."

3. "When you put your hand on it and the heat from your hand goes in that little ball, does it build up pressure and make it push over to the other ball?"

4. "Is that the natural color of the chemical?"

5. "If you did the same demonstration in a completely dark room would it still work the same way?"

SET II

6. "It seems to move only from left to right."

7. "Another reason why the liquid moves so quickly is because of its low boiling point."

8. "If you did the same thing in a room that was 30 degrees colder would it still work in the same way?"

9. "Does it have anything to do with the heat in your hand?"

10. "Why does glass conduct heat faster than plastic?"

SET III

11. "If instead of just putting one hand on a ball you put one hand on a ball and the other hand on the tube between the balls, will the red stuff still move?"

12. "Does your hand have to be warm before it works?"

13. "Does it matter how cold your hand is?"

14. "If you were to put mercury in the glass instead of what's in there would it work the same way?"

ANSWER SHEET
Exercise II

Handout 5.12

SET I

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
1. "OK." (ACCEPTING)	THEORETICAL DATA: Student sharing a belief or an observation.
2. "OK." (ACCEPTING)	THEORETICAL DATA: Student sharing an observation.
3. "Well, you'll have to decide that. My role is not to confirm your idea." (STRUCTURING)	SYNTHESIS: Student sharing an idea containing a causal relationship between hand, heat and pressure and asking the teacher to confirm it.
4. "No." (RESPONDING TO DATA PROBE)	VERIFICATION: Student confirming a property of the liquid.
5. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating a new environment or condition in which event takes place to see what will happen.

SET II

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
6. "Hmm." (ACCEPTING)	THEORETICAL DATA: Student sharing an observation.
7. "OK." (ACCEPTING)	NECESSITY: Student explaining the movement of the liquid through a single variable, a property of the liquid.
8. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating new environmental conditions.
9. "You'll have to decide that." (STRUCTURING)	NECESSITY: Student explaining the event using the single variable of heat and asking teacher to confirm it.
10. "Yes, why does it?" (FOCUS SETTING)	PROBLEM FOCUS: Student finding his own problem for inquiry. Question asks for explanation of cause.

Answer Sheet
Exercise II

Handout 5.12

SET III

Possible Teacher Actions to Fulfill Intent of Allowing Inquiry to Happen	Inquirer Action Classified Reason for Classifying
11. "Yes." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing the original event by creating another event, hand grabbing tube, to see the effect.
12. "You'll have to decide that." (STRUCTURING)	NECESSITY: Student wants confirmation of a single variable being cause of movement.
13. "You'll have to decide that." (STRUCTURING)	NECESSITY: Same as above.
14. "No." (RESPONDING TO DATA PROBE)	EXPERIMENTATION: Student changing original problem event by manipulating an object, the liquid.

SUBJECT OF OPERATIONS
Exercise I

Handout 5.13

NOTE: In response to the student action items in these materials, the teacher is to identify the SUBJECT OF OPERATIONS rather than the OPERATION. Trio members may wish to refer to Handout 5.1 to refresh their memories on SUBJECT OF OPERATIONS.

SET I

1. "Does the stuff move because it runs toward the light?"
2. "Is one ball on the pulse glass larger than the other ball?"
3. "Heat has a tendency to rise."
4. "I guess there was pressure from your hands."
5. "Does air have color?"

SET II

6. "If you were to take that tip off the glass would it still work?"
7. "When you hold your hand on the one bulb, does it get hot inside while the other bulb stays cold, so that the heat forces the liquid over to the cold bulb?"
8. "The air has to go out and the liquid has to go in."
9. "Why doesn't the liquid run up when you hold the glass vertical?"
10. "Why wouldn't the liquid move if there was air in the glass?"

SET III

11. "The pulse glass works like the collapsing can experiment."
12. "Do the molecules of the gas expand so fast that they just make the liquid go over."
13. "If I were to put a very small hole in top of one of the bulbs and grabbed that bulb with my hand, would the red liquid still move?"
14. "Does it move along like that because of pressure?"
15. "If, instead of grabbing the ball, he had blown on it, would the liquid still move?"

ANSWER SHEET
Exercise I

Handout 5.13

SET I

1.	EVENT	The stuff moves because it runs toward the light. Running toward the light is the EVENT.
2.	CONDITION	Size of the balls refers to the CONDITION of the balls.
3.	PROPERTY	This is a theoretical data statement and is not an operation. The subjects of theoretical data statements are unclear, lacking the context of generating data operation. However, it seems the subject is the characteristic of heat rising, hence a property of heat.
4.	OBJECT OR CONDITION	This is a theoretical data statement and so there is no operation and nothing being operated on. However, one might consider pressure here as an OBJECT. If you said the subject of the statement was CONDITION, that's OK too, since pressure might be the CONDITION of the hand.
5.	PROPERTY	This is a probe for something that is characteristic of air.

SET II

6.	CONDITION OR OBJECT	This is an experiment to alter the shape of the pulse glass or its CONDITION. If you figured the "tip" as an OBJECT and considered the operation involved with removing this OBJECT, then you may have identified the OBJECT as the subject of this experimentation operation. That's OK.
7.	CONDITION	Synthesis operations usually have more than one subject. It is sometimes difficult to identify a subject without knowing more about what the student has done to get to the point of synthesizing. Here it appears he is talking about the CONDITION of the bulb (getting hot inside) changing and that this heat causes a force. Whether he is saying this force is a PROPERTY of heat is not altogether clear here.
8.	OBJECT	Theoretical data statements so there is no operation. However, the subjects appear to be the OBJECTS (air and liquid).

Answer sheet
Exercise I

Handout 5.13

SET II

9. **EVENT** Student's problem focus questions are not operations. Like the teacher's problem focus, they are always concerned with EVENTS. Here the EVENT is the liquid not going up.

10. **EVENT** Student problem focus question and the above would apply.

SET III

11. **EVENT** The subject of this analogy statement is an EVENT called the collapsing can.

12. **CONDITION** CONDITION of the molecules (expanding fast) seems to be the subject of this necessity operation. He has not suggested that molecules are a PROPERTY of gas so we cannot say that he is operating with PROPERTIES.

13. **CONDITION** The student is experimenting with the CONDITION of the pulse glass; here the CONDITION is a pulse glass with holes. You may have considered the hole to be an OBJECT, in which case the OBJECT, hole, would be the subject of the operation. The teacher would want to look carefully at what the student was doing to see if he was just interested in "holes" or if he was really interested in the "closed system" condition of the pulse glass. A student working with the "closed system" condition would have greater predictable power than if he was working with the idea of the hole itself being the significant factor.

14. **OBJECT** Lacking other evidence, it appears that pressure is being considered as an OBJECT. The student is saying, "Pressure did it," much as another says "The hand did it." If the student had said something like, "A difference in pressure caused it," then we might suspect that he is operating with CONDITIONS.

15. **EVENT** We don't really know what the student had in mind outside of creating a new EVENT, "blowing." Is he interested in heat, pressure, or what? He is only operating on the EVENT, "blowing."

SUBJECT OF OPERATIONS
Exercise II

Handout 5.14

NOTE: In response to the student action items in this exercise, the teacher is to identify the SUBJECT OF OPERATIONS.

SET I

1. "Heat rises."
2. "Did you tip it when you did the demonstration or did you hold it level?"
3. "If you hold it upside down so that both balls are down on the bottom and if you grab one ball, will the liquid move to the other?"
4. "The liquid moves because the pulse glass works like a magnet."
5. "His pulse is beating fast."
6. "The heat of the hand makes the vapor in the bulb expand. But the vapor can only expand so far before it starts pushing on something. The easiest thing for it to push on is the liquid. So the expanding vapor pushes the liquid over."

SET II

7. "Is there air in the pulse glass?"
8. "There is a gas in there."
9. "If you put a match on one side and an ice cube on the other, would the liquid go to the side with the ice cube?"
10. "When you hold your hand on the ball it gets hot inside forcing the liquid over to the other side."
11. "Why is all the liquid in one bubble?"

SET III

12. "Why does it boil like that?"
13. "When you put your hand on the bulb, the heat from your hand goes in that bulb. It builds up pressure and the pressure pushes the liquid over to the other bulb."
14. "If, instead of having the amount of liquid we have in the glass now, we had twice as much, would it still work in the same way?"
15. "Do you have to use that size ball?"
16. "The liquid moves because you squeeze the little tip."

ANSWER SHEET
Exercise II

Handout 5.14

SET I

1.	PROPERTY	The subject here is a PROPERTY of heat, (heat rises).
2.	EVENT OR CONDITION	The student is asking about the original EVENT or asking about the CONDITION of the pulse glass during the original event.
3.	CONDITION	Again, it is CONDITION, position, of the pulse glass that is the subject of this experiment.
4.	OBJECT	The subject of this analogy statement is the OBJECT, magnet.
5.	OBJECT	This is a theoretical data statement and is not an operation. The OBJECT, pulse, is the subject of the statement.
6.	CONDITION AND PROPERTY AND EVENT	The "heat of the hand" would be CONDITION or PROPERTY; the "vapor only expanding so far" is PROPERTY; the "expanding vapor pushing the liquid" is an EVENT.

SET II

7.	OBJECT	The subject of the verification operation is the OBJECT, air.
8.	OBJECT	Theoretical data statement and no operation. The OBJECT, gas, would be the subject of the statement.
9.	EVENT AND OBJECTS AND CONDITION	The student sets up a new EVENT. The subjects of the experiment operation are the OBJECTS, match and ice cubes. However, one would almost feel this question goes beyond just the objects themselves and deals with the contrasting CONDITIONS of a warm bulb and a cold bulb.
10.	CONDITION	Although synthesis operations usually contain more than one subject, it appears here that the student is dealing with the CONDITION of the inside of the ball. Another subject that he deals with is the OBJECT, hand.
11.	EVENT	Like the teacher's problem focus, the subject is always an EVENT. In this case it is the EVENT of all the liquid being in one bubble.

Answer Sheet
Exercise II

Handout 5.14

SET III

12.	EVENT	Another problem focus question. Here, the subject is the EVENT, boiling.
13.	OBJECT AND CONDITIONS AND EVENT	He is synthesizing about the OBJECT, hand, the EVENT of the heat transferring from hand to bulb and the pressure CONDITION within the bulb.
14.	CONDITION	The CONDITION of the glass, the amount of liquid in it is the subject of this experiment operation.
15.	CONDITION	The CONDITION of the ball, the size, is the subject of this necessity operation.
16.	EVENT	The EVENT, squeezing, is the subject here.

SUBJECT OF OPERATIONS
Exercise III

Handout 5.15

NOTE: In response to the student action items in this exercise, the teacher is to identify the SUBJECT OF OPERATIONS.

SET I

1. "The liquid might go to the top."
2. "I think those are air bubbles."
3. "When you put your hand on it and the heat from your hand goes in that little ball, does it build up pressure and make it push over to the other ball?"
4. "Is that the natural color of the chemical?"
5. "If you did the same demonstration in a completely dark room, would it still work the same way?"

SET II

6. "It seems to move only from left to right."
7. "Another reason why the liquid moves so quickly is because of its low boiling point."
8. "If you did the same thing in a room that was 30 degrees colder, would it still work in the same way?"
9. "Does it have anything to do with the heat in your hand?"
10. "Why does glass conduct heat faster than plastic?"

SET III

11. "If, instead of just putting one hand on a ball, you put one hand on a ball and the other hand on the tube between the balls, will the red stuff still move?"
12. "Does your hand have to be warm before it works?"
13. "Does it matter how cold your hand is?"
14. "If you were to put mercury in the glass instead of what's in there would it work the same way?"

ANSWER SHEET
Exercise III

Handout 5.15

SET I

1.	EVENT	Subject of the statement is EVENT, "liquid going to the top."
2.	OBJECT	Theoretical data statement; subject of statement is OBJECT, air bubbles.
3.	OBJECT AND EVENT AND CONDITION	One subject is the OBJECT, hand. He is also synthesizing with the EVENT of heat going from hand to ball. The "building up of pressure" refers to the CONDITION of the ball.
4.	PROPERTY	Student is verifying a characteristic of the liquid.
5.	CONDITION	To control the state of darkness in a room would be to operate on the CONDITIONS of the room.

SET II

6.	EVENT	Theoretical data statement with no operation; subject of statement is the EVENT, moving from left to right.
7.	PROPERTY	A characteristic or PROPERTY of a liquid is its boiling point.
8.	CONDITION	Experimenting with the temperature of a room is to operate on its CONDITIONS.
9.	OBJECT OR PROPERTY	Perhaps his idea has to do not just with the OBJECT, hand. He may be working with warmth as a PROPERTY of the human hand. It's hard to tell from this one statement.
10.	PROPERTY	He is asking why the PROPERTIES of conduction in glass differ from those in plastic.

SET III

11.	EVENT	Placing a hand in a different part of the pulse glass would create a new EVENT.
12.	CONDITION	The warmth or CONDITION of the hand is the subject of this necessity operation.

Answer Sheet
Exercise III

Handout 5.15

SET III

13.	CONDITION	The warmth or CONDITION of the hand is the subject of this necessity operation.
14.	OBJECT	Substituting mercury in the pulse glass would be to operate on the OBJECT.

SELF-TEST FOR IDENTIFYING OPERATIONS AND SUBJECTS OF OPERATIONS

Handout 5.16

Below are student actions in response to the pulse glass problem. To the left of each item classify the inquirer action and the subject of the action. Below each response write in how you, as a teacher, would respond to the student using the allowing inquiry tactical moves.

INQUIRER ACTION	SUBJECT OF ACTION	
__________	__________	1. Does it matter what side your hand is on in order to make the liquid move?
__________	__________	2. Is that cranberry juice in there?
__________	__________	3. Does it move because the light is a heat source which causes the electrons in the liquid to rotate, and the rotation sets up a magnetic field which propels the liquid to one side?
__________	__________	4. Why does it stop bubbling?
__________	__________	5. If you used a cold hand, would it do the same thing?
__________	__________	6. What's the name of the fluid?
__________	__________	7. Does the pulse glass work like a neon sign?
__________	__________	8. Would the pulse glass work if it were made out of metal instead of glass?

Self-Test for Identifying Operations and Subjects of Operations

Handout 5.16

INQUIRER ACTION	SUBJECT OF ACTION	
________	________	9. Does the temperature of the hand make a difference?
________	________	10. It's a special liquid in there.
________	________	11. Does the liquid evaporate?
________	________	12. It moves because the hand heats the liquid and causes it to evaporate. The evaporating liquid causes a pressure which pushes on the liquid.
________	________	13. He was slanting the tube when he held it.
________	________	14. Why doesn't it work when Mary holds it?
________	________	15. It works like a balloon. When you squeeze it, it goes over here.
________	________	16. Why does the red liquid get darker after it bubbles for awhile?
________	________	17. Does the kind of liquid that's in there matter?
________	________	18. If I put cranberry juice in there, would it work the same way?

ANSWER SHEET FOR SELF-TEST ON IDENTIFICATION

Handout 5.17

Inquirer Action and Subject of Action Classified and Reason for Classifying	Possible Teacher Action to Fulfill Intent of Allowing Inquiry to Happen
1. NECESSITY: Student asking teacher to confirm if the variable, position of the hand, is important. Subject = EVENT: The student is asking, "This event, right side, or this event, left side?"	"That's your job to decide." (STRUCTURING)
2. VERIFICATION: Student confirming the liquid. Subject = OBJECT: Cranberry juice.	"No." (RESPONDING TO DATA PROBE)
3. SYNTHESIS: Student asking teacher to confirm if the relationship he has established between variables heat, electrons, and magnetic field is accurate. Subject = PROPERTY, EVENT: Heat is a property of light and the events are electrons rotating and magnetic fields propelling.	"You'll have to decide that." (STRUCTURING)
4. PROBLEM FOCUS: Student identifying a problem for inquiry; question is asking for explanation of cause. Subject = EVENT	"Yes, why? Maybe you want to work on that." (FOCUS SETTING)
5. EXPERIMENTATION: Student changing a condition within original event. Subject = CONDITION: State of hand is condition.	"No, exactly the same." (RESPONDING TO DATA PROBE)
6. VERIFICATION: Subject = OBJECT	"Methylene Chloride." (RESPONDING TO DATA PROBE)

Answer Sheet for Self-Test On Identification

Handout 5.17

Inquirer Action and Subject of Action Classified and Reason for Classifying	Possible Teacher Action to Fulfill Intent of Allowing Inquiry to Happen
7. ANALOGY: Student comparing pulse glass to neon sign and asking if his comparison is a good one. Subject = OBJECT	"You'll have to decide that." (STRUCTURING) OR "Interesting, what do you mean, 'like a neon sign'?" (CLARIFYING)
8. EXPERIMENTATION: Student changing a condition to see what would happen. Subject = OBJECT	"Yes, it would." (RESPONDING TO DATA PROBE)
9. NECESSITY: Student asking teacher to confirm if variable temperature is important. Subject = CONDITION	"You'll have to decide that." (STRUCTURING)
10. THEORETICAL DATA: Student sharing a belief. Subject = CONDITION	"OK." (ACCEPTING) OR "What do you mean, 'special'?" (CLARIFYING)
11. VERIFICATION: Student confirming an event. Subject = EVENT	"Yes." (RESPONDING TO DATA PROBE)
12. SYNTHESIS: Student's idea relates heat, evaporation, pressure. Subject = OBJECT, EVENTS, CONDITION OBJECT, hand, causes EVENT, evaporation, which caused a CONDITION of pressure which caused EVENT of pushing.	"OK." (ACCEPTING)
13. THEORETICAL DATA: Student sharing a belief or an observation. Subject = EVENT	"OK." (ACCEPTING)

Answer Sheet for Self-Test On Identification

Handout 5.17

	Inquirer Action and Subject of Action Classified and Reason for Classifying	Possible Teacher Action to Fulfill Intent of Allowing Inquiry to Happen
14.	PROBLEM FOCUS: Student's question asks for explanation of cause. Subject = EVENT	"Yeah, how come?" (FOCUS SETTING)
15.	ANALOGY: Student comparing pulse glass and balloon. Subject = OBJECT, EVENT	"OK." (ACCEPTING) OR "What do you mean, 'like a balloon'?" (CLARIFYING)
16.	PROBLEM FOCUS: Student asking for a causal explanation. Subject = EVENT	"That's another question you may want to work on." (FOCUS SETTING)
17.	NECESSITY: Student asking if a variable "kind of liquid" is important. Subject = PROPERTY, CONDITION Kind of liquid could refer to CONDITION of liquid or PROPERTY of liquid.	"You'll have to decide that." (STRUCTURING)
18.	EXPERIMENTATION: Student changing liquid to see if it makes a difference. Subject = OBJECT	"No." (RESPONDING TO DATA PROBE)

Name________________________________ Date__________________________

For each of the inquirer actions below, write:

A. How you would respond to the student.

B. What action the student is taking.

C. Why you responded the way you did.

1. Does the red stuff in the tube move because of light?

A.

B.

C.

2. I think that red stuff in there is like carbonated water. When you shook the glass, the liquid let off a gas, like when you shake a pop bottle. The gas makes pressure and pushes the liquid over.

A.

B.

C.

3. If the liquid was, oh, like 20 degrees hotter, would it still work?

A.

B.

C.

4. I'm not sure, but I think heat makes it move, but I need to know if you put something cold on it, that wasn't warm at all, would it still work?

A.

B.

C.

5. Could a fly live in the top of one of those little balls?

   A.

   B.

   C.

6. Why does it bubble like that?

   A.

   B.

   C.

7. Well, liquid boils at different degrees.

   A.

   B.

   C.

8. If I wanted to know if cold would make it go, we could do the experiment by putting ice on it, to see if it would move...work.

   A.

   B.

   C.

9. Well, were those bubbles, when you held it up, when it went into the arch, were those air bubbles, when it went up to the other red, to the gas...glass ball?

   A.

   B.

   C.

10. It kind of looks like a thermometer.

   A.

   B.

   C.

11. Well, for a while there, I thought it worked because of heat. Now I'm not sure because it also moves when something cold is on there.

    A.

    B.

    C.

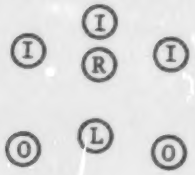
SUBSET 6
PRACTICING ALLOWING INQUIRY MOVES

115 Minutes

NOTES TO LEADERS

You will need to make some labels for this subset. For each group of six, make a label with the letter A a label with the letter B and a label with the letter C. For a group of seven members, you will need an additional letter, D. You can use masking tape or, better yet, use regular name tag pins.

Also, use the following diagram to see that the participants set up their groups properly. The diagram can be placed on the board, a chart or an overhead transparency.



L = Leader
O = Observer
I = Inquirer
R = Tape Recorder

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 6
2. Newsprint or overhead transparency of small group arrangement as shown above
3. Prepare letter/labels for distribution
4. Be prepared to distribute HANDOUTS 6.3 - 6.10
5. PARTICIPANT MATERIALS

6.1	Directions for Observer Guide	
6.2	Observer Guide: Allowing Inquiry Moves	
6.3	Problem Focus I	FOR DISTRIBUTION
6.4	Problem Focus II	FOR DISTRIBUTION
6.5	Problem Focus III	FOR DISTRIBUTION
6.6	Problem Focus IV	FOR DISTRIBUTION
6.7	Problem Focus V	FOR DISTRIBUTION
6.8	Problem Focus VI	FOR DISTRIBUTION
6.9	Problem Focus VII	FOR DISTRIBUTION
6.10	Problem Focus VIII	FOR DISTRIBUTION

SUBSET 6

RATIONALE	MINUTES	SCHEDULE
a)	3	a) Introduce Subset 6. Show SCHEDULE OF ACTIVITIES.
b) Observation guides can serve as a tool for providing the participant with accurate and meaningful feedback. This enables him to assess where he is and how he is progressing.	4	b) Refer to HANDOUT 6.2 and indicate how it is used.
c) Participants can become skilled in using an observation guide to provide accurate and meaningful, observable, behavior feedback to one another. The participant enacting the teacher will begin to develop skill and confidence in using the tactical moves. The participant enacting the inquirer will intuitively use inquirer operations and experience inquiry from the viewpoint of the inquirer.	1	c) Explain leader, observer and inquirer tasks and the problem focuses.

LEADER INPUT

a) FOR THIS EXERCISE EACH PARTICIPANT WILL PRESENT A PROBLEM FOCUS FOR INQUIRY TO MEMBERS OF A SMALL GROUP. He will try using only the allowing inquiry tactical moves. These are the moves that are necessary for maintaining the conditions of Focus, Freedom and Responsive Environment. These moves enable pupils to inquire. Therefore, these are the moves we will learn and practice first. You will find the helper skills practiced earlier of particular advantage as you attempt to understand fully the inquirer and the words he is using. Each participant will tape record his practice efforts and check to see that he is getting a clear recording. Observers will report on the degree to which the leader used only the allowing inquiry tactical moves.

b) HANDOUT 6.2 is one that each of you will be using as you function as observer in your small group. The directions for this guide, given on HANDOUT 6.1, ask you to listen to what the leader is saying and match it with the items numbered 1 - 7 on the left of the guide. Once you have matched the teacher behavior or move with an item, make a tally mark in the column which identifies the responder. The responder will be either the group at large or one of the inquirers identified as A, B, C, or D. Take three minutes to read the directions and review the guide. PAY PARTICULAR ATTENTION TO THE BEHAVIOR WHICH DEFINES EACH OF THE MOVE ITEMS ON THE GUIDE SHEET. (Time 3 minutes)

c) Within your small group, each of you will have a chance to practice as leader, inquirer and observer. As leader you will be presenting a problem focus for inquiry to the inquirers of your small group. After reading the problem focus and the focusing question, it is up to the inquirers to question as they see fit. The observers will use the observer guide which you have just reviewed. For each practice round you will have one leader and two observers. The remainder of the group will be inquirers.

Each of the problem focuses you will use has to do with a behavioral anecdote at school. Attached to each problem focus sheet is a set of directions for the leader to generate his own set of data about the anecdote so that he can respond to inquirer data probes. There are many sources of inquirer data. But for purposes here, the leader will be serving as a data source.

SUBSET 6

	RATIONALE	MINUTES		SCHEDULE
d)		2	d)	Ask participants to form small groups within immediate area and show diagram of group member arrangement.
e)	In order for participants to enact the role of teacher at this stage and so there are "new" problem focuses for inquirers, participants need to be given problem events which they can identify from their own experience. They can, thereby, develop their own sets of data. Then, they will be able to provide data for inquirer probes.	6	e)	Give directions and THEN distribute HANDOUTS 6.3, 6.4, 6.5, 6.6, 6.7, 6.8 and allow participants to read and generate data on anecdote. (HANDOUT 6.9 is for small groups with seven members.)
f)		5	f)	Pass out inquirer letters and give directions for their use. Ask participants to get tape recorders ready.
g)		4	g)	Give directions for getting started in small groups. Refer again to coded diagram.

LEADER INPUT

d) Before we go on, take just a few minutes to form your small groups. Please form your groups according to this diagram. [Diagram on board, chart or overhead transparency. See page 386.] (Time 2 minutes)

e) I am going to pass out enough problem focuses for each member of your small group. They are numbered I, II, III, IV, V, VI, VII, VIII. At the top of the sheet is the approximate age level from which the anecdote was taken. Pass them around your small group, quickly taking one that fits the age level you are most comfortable with. It may be that you won't all get the age level you prefer, so try with the one you get. It is important that ONLY each group member is aware of his problem focus so DON'T STOP AND READ THEM WHILE THEY ARE BEING PASSED OUT. After you select yours by age level, follow the directions at the top of the sheet. (Time 6 minutes)

f) You have noticed the observers will be tallying the leader's move in response to individual inquirers as well as the group at large. So that INQUIRERS within the group can be identified easily by the leader and on the tape, which the leader will make, please choose a letter badge to wear. Put it on so it can be seen easily by the leader. When the leader is calling on inquirers, he should call them by letter. Leaders, when you call on an inquirer, try to remember to identify him by letter.

g) The leader will begin by reading his problem focus and focusing question to the inquirers. The inquirers will have seven minutes to inquire using the leader as their data source. Then the observers will have eight minutes to report to the leader and for the leader to get clarity on his report. Leader and observer roles will then shift around the group for six rounds. IT IS NOT TO BE ASSUMED THAT THE LEADER IS THE TEACHER OF THE PRINCIPAL CHARACTER IN THE ANECDOTE. RATHER, THE LEADER IS KNOWLEDGEABLE ABOUT A SPECIFIC INCIDENT AND THE PEOPLE INVOLVED.

I will start and stop each of the rounds and tell the observers when to report. Get set to go for the first round. The leader, inquirers and observers should be in their positions as indicated on the diagram.

SUBSET 6

RATIONALE	MINUTES	SCHEDULE
h)	7	h) Ask small groups to begin.
i)	8	i) Stop small groups and ask observers to report.
j)	15	j) Ask trios to switch leaders and observers and start on second round.
k)	60	k) Continue for all six rounds stopping after the seven-minute inquiry and eight-minute observer's report. Repeat observer directions for the second round. Call for a break after the third round.

LEADER INPUT

h) Small groups, please begin your first round. (Time 7 minutes)

i) One observer should report to the leader, followed by the second observer. Observers report by reading their observer guides and noting the various moves used. Where observers disagree or are not sure of what they observed, they can identify the incident by inquirer or the group at large and locate it on the tape recording. The tape can serve as a data source for looking at ambiguities and differences in observations. (Time 8 minutes)

j) Observers, please stop your reports. It is time to shift tasks for the second round. Simply rotate the leader task clockwise for each round, then rotate the observer and inquirer tasks. Keep in mind that for a group of six, each member should be leader once, observer twice, and inquirer three times. Exchange the inquirer letter badges for each round. (Time 15 minutes)

k) Time each of the rounds: seven minutes for inquiry, eight minutes for reporting. Make sure to allow for a break after the third round. (Time 60 minutes)

DIRECTIONS FOR OBSERVER GUIDE
Allowing Inquiry Moves

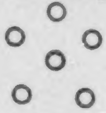
Handout 6.1

1. Read down the items in the left-hand column of the guide sheet to become familiar with the leader moves.
2. While the inquiry enactment is taking place, observe each move of the leader and match it with an item on the guide sheet.
3. Tally (𝍸) each leader move in the column indicating the respondents of the teacher move. The respondent will be either the group at large or Inquirer A, B, C, D.
4. Proper tallying is important:
    a. Observer tallies will be compared
    b. Leaders need to be aware of the kind of responses they're making

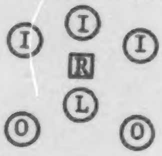
DIRECTIONS FOR SMALL GROUP EXERCISE, SUBSET 6

In this exercise, each small group member will rotate through the roles of leader, inquirer and observer. The leader will present a problem focus and attempt to use only allowing inquiry moves. The observers will use Handout 6.2 to record teacher moves.

1. Familiarize yourself with the Observer Guide, Handout 6.2.
2. Arrange the chairs according to the following diagram.



3. Each participant should select and read only one of the school anecdotes that serve as problem focuses.
4. Select a leader, observers (2) and inquirers (3) for the first round and give the inquirers their letter/labels.
5. Persons in the various roles should position themselves according to the diagram shown below. Make sure the tape recorder is ready.



I = Inquirer
L = Leader
O = Observer
R = Recorder

6. The leader should present a problem focus from those distributed. He should try to use only ALLOWING INQUIRY MOVES with the inquirers.
7. Observers should tally leader moves independent of one another. After the enactment, they will report on the moves tallied and make comparisons.
8. Repeat this procedure for the next five rounds so everyone has an opportunity to be a leader, an observer and an inquirer at least once.

OBSERVER GUIDE:
Allowing Inquiry Moves

Handout 6.2

SCAN	TALLY TOTAL				
	AT LARGE	INQUIRER A	INQUIRER B	INQUIRER C	INQUIRER D
1. FOCUS SETTING Leader deliberately sets the inquiry focus by reading the problem focus.					
2. STRUCTURING Leader structures by defining student-teacher roles and/or giving ground rules.					
3. CLARIFYING Leader takes action to better understand a student by asking for meaning, by saying he is not sure what is being said, by paraphrasing.					
4. TEACHER SILENCE After the problem or during a lull in the discussion, the leader waits, allowing a student to break the silence.					
5. RESPONDING TO DATA PROBE Leader provides data requested by a student.					
6. ACCEPTING Leader makes statements or takes action to show that he accepts a student's ideas and feelings.					
7. OTHER Leader takes other actions, outside allowing inquiry: giving more data than requested, asking questions for other reasons than to understand a student.					

PROBLEM FOCUS I

Handout 6.3
AGES 6-9

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

Jim was on the playground during recess last week. There were lines of children behind the slides, swings and rings awaiting their turns. Other children were playing hopscotch and jump rope. Jim came flying across the playground. He stopped at a hopscotch game, picked up one of the player's markers and threw it in the air. He turned to run and tripped over a jump rope, he fell to one knee, tore his trousers and pulled the rope out of the hands of one of the children. Jim jumped up again and ran to the sandbox. He began walking, balancing on the edge of the box. He made one complete tour around the perimeter without falling. Then he leaped in the air, crashing on top of another child and smashing a sand castle. He jumped up and ran toward the slide.

FOCUS QUESTION: "Why did Jim behave this way?"

PROBLEM FOCUS II

Handout 6.4
AGES 9-12

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

The teacher was at the blackboard working with a small group of students on arithmetic problems. Other members of the class were doing similar work at their desks. Sue was among those assigned to desk work. At the moment, however, she was at the teacher's desk stacking papers, putting pencils in the drawer, placing books between the bookends. The teacher looked up and asked Sue to return to her work. She started toward her desk. As she passed the aquarium she stopped. The aquarium was a cloudy brown. Taking a small jar, Sue scooped water from the tank and poured it into the sink. After two scoops, the teacher asked her to stop what she was doing and finish her work. Sue walked to her desk and opened the top. She began arranging her books. She took out pieces of paper which she wadded up and threw in the wastebasket. The teacher looked up, observed what Sue was doing and said nothing.

FOCUSING QUESTION: "Why did Sue behave as she did?"

PROBLEM FOCUS III

Handout 6.5
AGES 12-15

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

Yesterday, Bill entered class after it had started. He sat down with his coat on. The teacher asked the class to stand for the flag salute. Bill stayed seated. The teacher waited for a few seconds, looking at Bill. Bill rose slowly and stood on one foot beside his desk. He said nothing and his hands were in his pockets during the pledge. The students were asked to take out their homework assignments. Bill was drawing on his desk and made no move to get his paper. The teacher looked at Bill. Bill opened his desk, took out his paper, and slapped it on the desk top with a bang. During the homework review, Bill continued to draw on his desk.

FOCUS QUESTION: "Why did Bill behave as he did?"

PROBLEM FOCUS IV

Handout 6.6
AGES 14-17

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

The teacher passed out the examination papers and gave directions for marking the answer sheet. Pete was seated in the corner of the room, alone, away from the rest of the students. His head was down on his desk and his hands were in his lap. During the first five minutes of the examination period he looked up twice, glanced toward the teacher and then marked his answer sheet. After fifteen minutes, the teacher observed Pete remove some small cards from his pocket and place them under his leg. During the remainder of the examination he kept his head on the desk, glancing up on twelve separate occasions to look toward the teacher and then mark his paper. At the end of the period, Pete handed in his paper on the way out the door. The teacher said nothing when Pete passed his desk.

FOCUSING QUESTION: "Why was Pete behaving this way?"

PROBLEM FOCUS V

Handout 6.7
AGES 14-17

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

The teacher had given directions for the students to work in small groups. Soon the students were involved in writing a field trip summary statement to be reported later to the total class. Bob left his group, walked to the teacher and asked if it was all right to write the summary paper in outline form. He returned to his seat and a few minutes later again sought out the teacher to ask if the statement should have a title. Back in the group, Bob worked for awhile and then motioned the teacher toward him to ask if the paper should be written in ink. Later in the day, after the summary statements had been reported and discussed, Bob approached the teacher to ask if the summary statements should be thrown away or kept.

FOCUSING QUESTION: "Why is Bob acting the way he is?"

PROBLEM FOCUS VI

Handout 6.8
AGES 9-17

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

Bruce and other students had their hands in the air. The teacher glanced around the room and called on Sue. As she began to read her poem, Bruce said in a voice that found the teacher quickly turning toward him, "You always call on the girls. Why don't you call on me?" The teacher said nothing and turned back to Sue who continued to read. Sometime later the school intercom requested a room messenger to report to the office. The teacher tapped Tom on the shoulder and asked him to go. "I never get to go to the office," Bruce said in a voice that was heard by the teacher across the room. "You let everyone go but me." The teacher looked at Bruce and asked him not to disrupt the class. "But you never let me do anything," Bruce replied.

FOCUSING QUESTION: "Why is Bruce behaving the way he is?"

PROBLEM FOCUS VII

Handout 6.9
AGES 13-17

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

Walter was the first student to enter the room for the second period. Although the teacher was sitting at his desk, no words or glances were exchanged. Walter moved toward a seat and gazed out the window. After a minute the teacher looked up and said, "Hi." Walter's eyes moved quickly from the window to his lap. His faint "hello," spoken toward the floor, was barely heard by the teacher. As the other students came into the room, Walter moved toward the rear. When the class began he was sitting alone with no student closer than four chairs away. Twice during the hour discussion period, the teacher glanced toward Walter and found him looking out the window, a faint smile on his face. When he was called on to respond to his question, his eyes quickly moved again to the floor where they remained. The only visible response he gave was a hunching of the shoulders. Some of the other students glanced toward him but none spoke.

FOCUS QUESTION: "Why did Walter behave this way?"

PROBLEM FOCUS VIII

Handout 6.10
AGES 7-12

Below is a school anecdote which undoubtedly you will recognize from your own teaching experience. When it is your turn to function as leader in the exercise, you will be reading this anecdote and the focusing question which follows it to the inquirers in your group. It will be their job to inquire into the anecdote and explain the behavior of the principal character. So that you can facilitate their inquiry and respond to their data probes, read through the anecdote. Then recall a similar situation, it doesn't have to fit exactly, in your own experience. Remember as much as you can about the person, his characteristics, family background, habits, interests, etc. In this manner you will be able to generate a set of data which you can use to respond to the inquirer's data probes.

YOU WILL BE READING THE ANECDOTE BELOW AS THE PROBLEM FOCUS, BUT YOU WILL BE RESPONDING TO DATA PROBES IN TERMS OF A SET OF DATA YOU KNOW FROM A SIMILAR SITUATION.

Irving had placed his Viking ship model carefully on the shelf in the rear of the classroom. He had just finished telling a small group of classmates about how it was used and why it was designed as it was by the early Norwegians. Grant, a member of the small group, had commented to Irving that he had a similar model only, "much bigger and fancier."

Later in the day, while the students were working on some projects, the teacher glanced up to see Grant standing in front of the model. He picked it up and grasping the oars on one side he snapped them off at the hull. He replaced the model on the shelf. As he passed an empty desk, he dropped the small oars inside. He returned to his project and the teacher said nothing.

FOCUS QUESTION: "Why did Grant behave this way?"

SUBSET 7
EVALUATING TEAMWORK RELATIONSHIPS

111 Minutes

NOTES TO LEADERS

This subset is a shift in focus for the participants. They are stopping work on some behavioral skills and are examining what is happening in trios and in the workshop at large. Participants need to be aware of this focus shift if the exercise is to be relevant to them.

In the 7-day workshop format, some participants have indicated they get tired at this point. Watch to see how they are working and perhaps cut back on time if fatigue is indicated.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 7
2. Newsprint or overhead transparencies of force field diagram
3. PARTICIPANT MATERIALS

   7.1 Force Field Technique for Diagnosing a Problem

   One set of No Carbon Required (NCR) paper

SUBSET 7

RATIONALE	MINUTES	SCHEDULE
a)	3	a) Introduce Subset 7. Show SCHEDULE OF ACTIVITIES
b) Participants need to know what a force field is before they can do their own.	15	b) Explain how force-field analysis works.
c) The force field is one technique by which the individual can share his perceptions and feelings about the trio's effectiveness	30	c) Ask participants to do a force field analysis on, "Achieving maximal learning within the trio."
d) Participants can conceptualize the idea "of getting data about themselves" from others.	3	d) Give input on letting others help gather data from yourself.

LEADER INPUT

a) IN THIS NEXT EXERCISE WE ARE GOING TO STOP LOOKING AT STUDENT-TEACHER INQUIRY BEHAVIOR AND TAKE TIME TO IDENTIFY THOSE THINGS WHICH ARE INTERFERING WITH AND/OR FACILITATING WORKSHOP LEARNING. Much of the workshop learning is dependent upon how we respond to one another in our trios and in the group at large. If there are responses being made that hinder learning we need this data so alternative responses can be examined and selected. THIS EXERCISE IS INTENDED TO GET THE DATA WHICH CAN BE USED IN TURN BY THE MEMBERS AND MYSELF TO MAXIMIZE WORKSHOP LEARNING. At this time we will shift focus to see how things are going so far. To do this we will:

1. Become acquainted with the force-field analysis technique
2. Individually write a force field
3. Share the individual force field with trio members and get help on saying what we mean

b) [Leaders, refer to Handout 7.1 to prepare this presentation. The smoking example offered is a good one to use. A sample transparency has been prepared for your use, see page 388.] (Time 15 minutes)

c) Now you will do your own force field. Draw the horizontal and vertical lines. The goal will be "Achieving maximal learning within the trio." To the left of the vertical line you will write those forces that are operating within the trio to help YOU achieve maximal learning. To the right of the vertical line you will write those forces that are operating within the trio that keep YOU from achieving maximal learning. You are identifying forces as YOU see them now. Use the three sheets of NCR paper for your force field so that you can share them later with the other trio members. Be sure that you are writing on the white sheet, otherwise you won't get two copies. (Time 30 minutes)

d) You will be giving other trio members copies of your force field. Before exchanging copies, each of you should select one or two forces that you think attention to would yield the most movement toward the goal of achieving maximal learning within the trio. These will be the forces that you will talk about with your trio members. THE IDEA IS THAT AS ONE TRIO MEMBER TALKS ABOUT HIS FORCES, THE OTHER TWO MEMBERS MAKE CERTAIN THEY ARE AWARE OF AND UNDERSTAND CLEARLY THE FORCES BEING DESCRIBED. You should be using the same listening and speaking behaviors practiced earlier. Trio members must understand what forces are perceived if they are to be able to consider effective alternative responses.

SUBSET 7

	RATIONALE	MINUTES		SCHEDULE
e)	Participants need another opportunity to identify only those forces which they feel comfortable in exploring if they are to have a successful experience.	3	e)	Ask participants to review the force field they just wrote. Ask participants to exchange force fields and select one trio member to begin.
f)	If the trio is aware of the forces which are restricting the learning of one member, either new facilitating forces will emerge or the restraining force will be reduced.	30	f)	Trios use a round robin exercise to share their force fields and help each other get more data. In 10-minute cycles, one person shares forces and gets help from the others.
g)	The leader asking for feedback from trainees legitimates the expression of restraining forces, thereby allowing the leader to take whatever possible corrective procedures necessary to maximize learning.	12	g)	Ask participants to meet in small groups and discuss things that are happening in the workshop to keep them from learning. Small group will pick two interferences to share with workshop group at large.
h)		15	h)	Leader gets clear definition of the major interferences that participants perceive to be restricting their learning.

LEADER INPUT

e) Before you exchange force fields, take just a few minutes to decide on the two or three forces that you want to talk about with the other two trio members. Make a check mark beside these forces. (Time 2 minutes)

Please exchange force fields. One member of the trio volunteer to begin by stating a force from his force field that he thinks attention to would yield greatest movement toward the goal of maximal trio learning.

f) [Allow 10 minutes for the first round. Stop trios and ask second member to share forces. Again, allow 10 minutes and stop trios. Ask third member to share forces.] (Time 30 minutes)

g) You have had a chance to identify and share those forces within your trio that are helping or hindering you to achieve maximal learning. In this sense, each of you has received data from the others about how each perceives the trio working together to help one another learn.

What I would like to do now is get some data from you on things in general that are interfering with your learning in the workshop. Please meet in your small groups and spend 10 minutes discussing general workshop conditions and procedures that get in the way of your learning. Have someone in the group keep a list of these. Then choose two items from your list that would be examples of the greatest interferences. I will ask each small group to share with the total group what they see as the two greatest interferences. If you end up with no interferences, this is fine.

[Allow 10 minutes. Then remind small groups they have two minutes to identify the two greatest interferences.] (Time 2 minutes)

h) Can I have the interferences from each of the groups? I will write them on the board as they are given. [Leader should make sure that he understands what the group means. It may be necessary to call for examples, or ask for illustrations.]

[Leader should review the total list to see what interferences he can deal with immediately. Noise, ventilation, space would be examples of interferences that he might easily correct. Other interferences might have implications for revising exercises, procedures and materials which require future planning and development.]

FORCE FIELD TECHNIQUE FOR DIAGNOSING A PROBLEM[1]

Handout 7.1

Suppose a youth worker came to you and said, "The group of children that I'm working with this year is very difficult. There is one child in particular who seems to cause the trouble. Do you think I should remove that child from the group? Do you believe this might solve my problem?" You would need to ask many questions of this youth worker in order to be helpful. This situation can be compared to a patient who comes to a doctor and says, "I have a terrible headache. Do you think I should undergo brain surgery?" The doctor naturally would conduct a careful diagnostic examination before even considering what action to take.

In both of these problem situations, someone has jumped directly from a problem to considering a plan of action. The real problem in both cases is that several important steps in the problem-solving process have been omitted. This paper will review those steps and give particular attention to the force field technique of diagnosing a problem.

ACTION-RESEARCH STEPS OF PROBLEM SOLVING

1. Identifying the Problem: Who is causing it and who is affected by it? What specific goals would need to be attained in order for it to be resolved? What kind of a problem is it? For example:

SELF:	Conflict of values and attitudes; my lack of skills; my inability to express feelings; a different perception
OTHER:	Lack of understanding or skills; unwillingness to use his resources; conflict about values and attitudes
ORGANIZATIONS:	Lack of communication channels, scheduled time and resources; unclarity about membership roles and norms; power conflicts in decision making; lack of support for innovation

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[1] Jung, Charles C. Reprinted from materials contained in Research Utilizing Problem Solving, an instructional system for teachers developed by the Northwest Regional Educational Laboratory, Portland, Oregon.

SOCIETY:	Conflict between community and school values; lack of clarity about goals; other structures in conflict with school structures.

What sources from research information would be needed to more clearly define the type of problem and validity of goal solution?

2. Diagnosing the Problem Situation: Once the problem has been clearly stated in terms of goals to be attained, one should identify the forces operating in the situation which tend to push toward or against a particular goal. As the true forces are identified, it often becomes clear the goals which were first thought to represent a solution are incorrect or inadequate. New goals must be stated and new forces identified repeatedly as one works toward resolution of the problem. Diagnosis is a continuous part of problem solving.

3. Considering Action Alternatives: As diagnostic work progresses, a range of action alternatives should emerge. Each should be considered in relation to knowledge of the forces operating in the problem situation. If one or some combination of the alternatives is tried, what will happen to the forces pushing toward or away from a particular goal? How will the forces operate to influence the success or failure of a trial of a particular action alternative?

4. Trying Out an Action Plan: At some point, one or a combination of the action alternatives will be attempted. As the attempt is made, information will be needed to assess whether there is movement toward the goals. This includes discovery of the forces which are changing to understand what is accounting for movement,

or the lack of it. Such assessment provides both an evaluation of progress and a new diagnostic picture. It clarifies the next action steps which need to be taken. It also may identify additional skills which may be needed in order to move ahead. This latter type of information should be the basis of inservice training closely related to any action program.

5. Diffusion and Adaptation: Information gained from action experience in dealing with a problem should be shared with others who face similar problems. Information to be diffused should include: A clear, specific problem statement; the forces involved in the problem situation; a description of action taken to change the forces; results of action including failures as well as successes; special problems that were encountered; and special skills that were needed to carry out particular actions. These kinds of information make it possible for persons in another setting to adapt elements of what was tried to their own diagnoses of their particular problem situations.

Continuous attention to diagnosis is the cornerstone of the action-research steps of problem solving. Without complete, accurate diagnosis, problems in youth work tend to multiply. Fads are accepted which don't really fit the local situations where they are applied. Potentially good solutions are abandoned without realizing the slight changes which are needed to make them work. Decisions are made on the basis of people's ability to argue or on the status of positions which they hold rather than on the true facts of the situation. Helpful innovations in youth work are rediscovered and die repeatedly without being effectively shared as people don't know what to tell or what to ask.

There are probably several reasons why good diagnostic work is not engaged in very actively by people who work with youth. One is that it is comparatively difficult to identify clear goals in helping youth to grow. An engineer can make accurate estimates of the kinds and quantities of materials he needs to build a power dam to produce a given amount of electricity in a certain setting. It is vastly more complicated for a youth worker to estimate the kind of experience that will help a group of children develop a trait, such as interdependence, appropriate to their innate abilities and the probable opportunities of their life setting.

It is often difficult to get accurate information even when goals can be stated clearly in work with youth.. The medical doctor listens with his stethoscope; views with his x-ray machine and analyzes with his chemical and electronic equipment. Youth workers are only beginning to be provided with the tools developed by social scientists to gather the sorts of diagnostic data of critical importance to their efforts. These include sensitivity to feelings, inner values and attitudes; ways to learn of the perceptions people have of each other; and the norms which operate in groups to influence the behavior of the individuals in them.

An especially important barrier to becoming involved in good diagnostic work is simply the lack of awareness of how important and satisfying such effort can be. Spending time gathering information, thinking about it, and planning on the basis of it is not a traditional part of the youth worker's role. There is little support or reward for time which is not spent in carrying out action or for time spent in working directly with youth or in carrying out administrative details.

FORCE FIELD TECHNIQUE FOR DIAGNOSING A PROBLEM

To use this technique, one must first state a problem in terms of a clear goal. An example will be used to illustrate the technique. Mr. Smith is a youth worker who states his problem as follows:

> As an adult working with a group of youth, I'm concerned about developing interdependence between us. I don't want the youth in our group to do things just because I suggest them. On the other hand, I don't want them to reject ideas just because they come from the adult. I have a goal for the group of becoming more open and active in criticizing what they see as helpful and nonhelpful in my suggestions and of seeking my reactions to theirs.

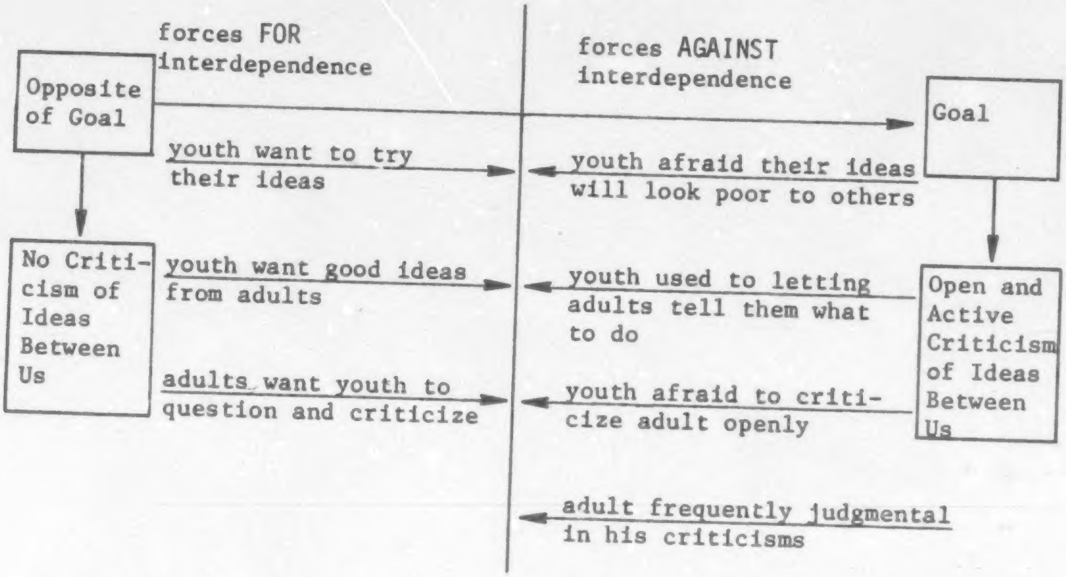
Mr. Smith now is ready to write out his first force field. He takes a blank sheet of paper and writes the general nature of the problem at the top. He then draws a horizontal line across the top. On the left side of the line he writes the words forces FOR interdependence. On the right side he writes forces AGAINST interdependence. In the right margin of the paper he writes the goal which he has specified for his problem, "open and active criticism of ideas between the group and me." In the left margin of the paper he writes the opposite of his goal, "no criticism of ideas between the group and me."

Now he draws a vertical line down the middle of the page. This line represents the way things are at the moment with regard to openness and activeness of criticism between him and the group. Things are the way they are at the moment because there is a set of forces pushing from the left toward openness and activeness of criticism, and an equal set of forces pushing from the right against openness and activeness. If the forces on the left become stronger while those on the right stay the same or get weaker, the line will move toward the right--toward more openness and activeness. Mr. Smith now must write out what he believes to be the important forces operating in this situation.

Diagram I presents his first effort at writing out the force field.

DIAGRAM I

Force Field No. 1 - Interdependence Between the Group and Me


forces FOR interdependence
forces AGAINST interdependence
Opposite of Goal
Goal
youth want to try their ideas
youth afraid their ideas will look poor to others
No Criticism of Ideas Between Us
youth want good ideas from adults
youth used to letting adults tell them what to do
Open and Active Criticism of Ideas Between Us
adults want youth to question and criticize
youth afraid to criticize adult openly
adult frequently judgmental in his criticisms

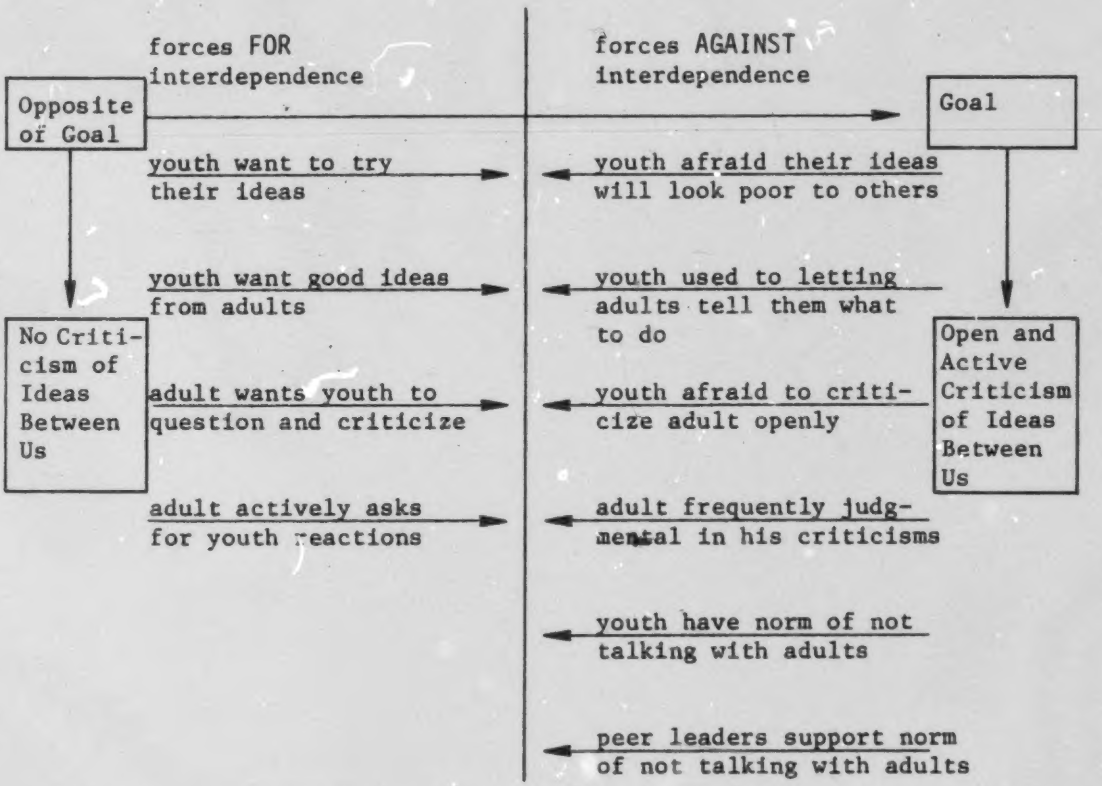
Mr. Smith wasn't very satisfied with his first effort to draw the force field. He suspected there were additional forces other than the ones he had thought of. During his next meeting with the youth, he raised the question of how people felt about discussing each other's ideas. He asked specifically for their reactions to some of the ideas he had recently suggested. He especially asked them to share their reactions. They seemed reserved, however, about giving them. One of them told him privately later, "We just don't talk about that with adults. I would have said some things, but the other kids would have thought I was being an apple polisher."

Mr. Smith believed he had learned two things from the discussion. One was that an additional "force for" was to actively ask the youth for their reactions. Another was that there was some kind of norm among the youth about not talking to adults in a way that would be seen as "apple polishing." This norm appeared to be an important "force against." He thought maybe the peer leadership of the group was an important "force against" which was affecting the way this norm operated in the group.

In Diagram II Mr. Smith has added these three forces to the force field.

DIAGRAM II

Force Field No. 2 - Interdependence Between the Group and Me


forces FOR interdependence
forces AGAINST interdependence
Opposite of Goal
Goal
youth want to try their ideas
youth afraid their ideas will look poor to others
youth want good ideas from adults
youth used to letting adults tell them what to do
No Criticism of Ideas Between Us
Open and Active Criticism of Ideas Between Us
adult wants youth to question and criticize
youth afraid to criticize adult openly
adult actively asks for youth reactions
adult frequently judgmental in his criticisms
youth have norm of not talking with adults
peer leaders support norm of not talking with adults

Mr. Smith now did three additional things with his force field. FIRST, he ranked all of the forces in terms of how important he thought they were in trying to change the situation. He put a number 1 by that force field which he believed would yield the most movement toward the goal if it could be changed. He put a 2 by the force that he thought would result in the second greatest amount of movement if changed, and so forth. SECOND, he rated each force in terms of how easy he thought it would be for him to bring about some change in it. He gave each force a rating of hard, medium or easy. THIRD, he again rated each force, this time in terms of how clear he was about whether it really was a force. Was he just imagining it to be a force, or was it really operating? He labeled each force as clear, partly clear, unclear.

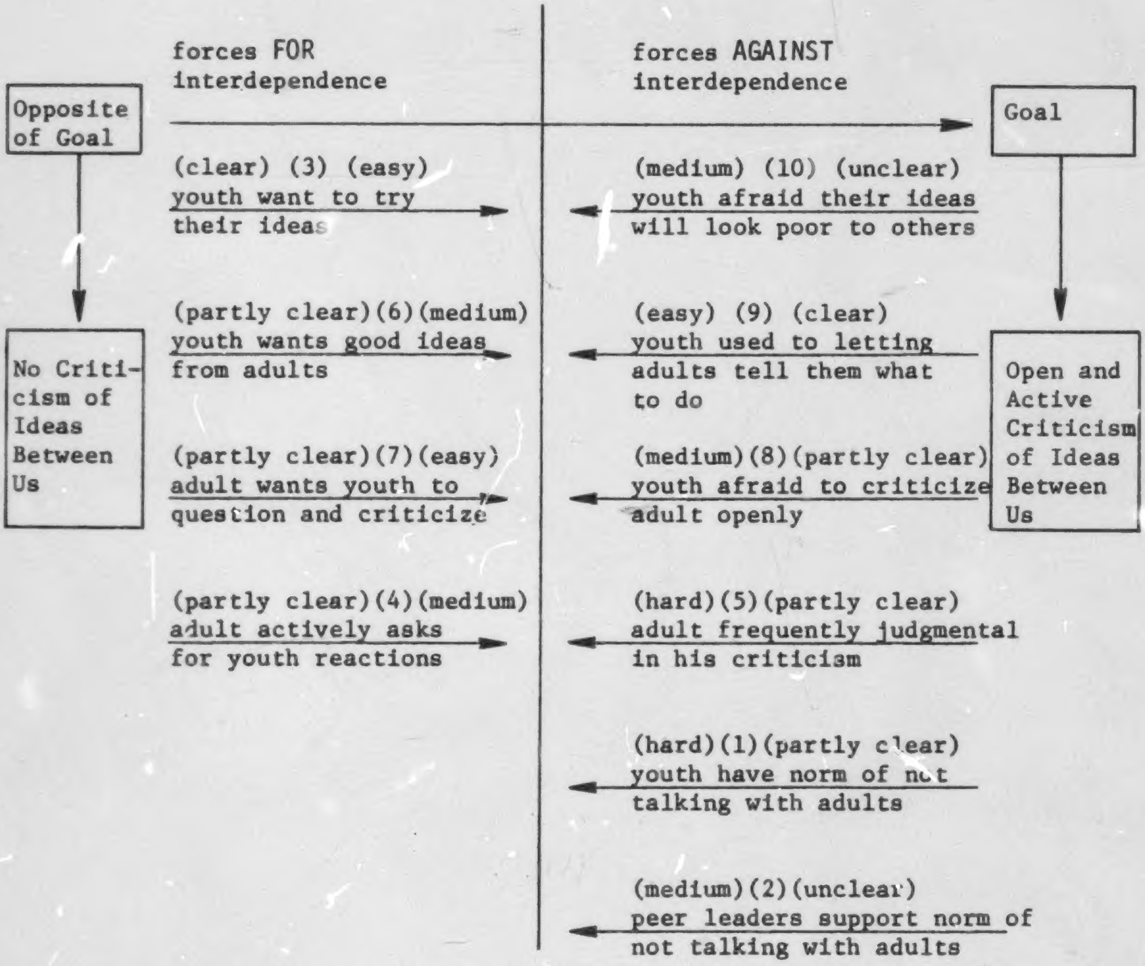
Diagram III presents Mr. Smith's force field at this point.

Force Field Technique for Diagnosing a Problem

Handout 7.1

DIAGRAM III

Force Field No. 2 - Interdependence Between the Group and Me


Opposite of Goal
No Criticism of Ideas Between Us
Goal
Open and Active Criticism of Ideas Between Us

forces FOR interdependence	forces AGAINST interdependence
(clear) (3) (easy) youth want to try their ideas	(medium) (10) (unclear) youth afraid their ideas will look poor to others
(partly clear)(6)(medium) youth wants good ideas from adults	(easy) (9) (clear) youth used to letting adults tell them what to do
(partly clear)(7)(easy) adult wants youth to question and criticize	(medium)(8)(partly clear) youth afraid to criticize adult openly
(partly clear)(4)(medium) adult actively asks for youth reactions	(hard)(5)(partly clear) adult frequently judgmental in his criticism
	(hard)(1)(partly clear) youth have norm of not talking with adults
	(medium)(2)(unclear) peer leaders support norm of not talking with adults

Now, Mr. Smith had a picture of what he thought was going on in his problem situation. The most important thing that stood out to him was that he was not very clear about some of the forces which he guessed to be important. He went back to the youth to get more information about forces that were not clear. He got this information both through discussions and by using questionnaires. The force which he had ranked as most important seemed so complex to him that he wrote out a force field diagram about it!

This helped him to identify further forces and questions he needed to discuss with the youth. Mr. Smith also began to consider ways he could alter some of the forces. He put some of these alternatives into action. His efforts to get information from the youth to determine the force fields turned out to be an action plan in itself which proved helpful. Mr. Smith found the group changing in the direction of his goal.

At the end of several weeks, Mr. Smith found it helpful to look back over his efforts. He could note the changes which had occurred in his force field over time. He knew that his current force field diagram was much more accurate than his first attempts had been. It was based on careful data gathering. He had gathered some kinds of data several times so that he could see evaluatively how some of the forces had changed in response to the action efforts which he and the youth had worked out. Most exciting to Mr. Smith was his discovery that he could share the force field technique with the youth. Now they were working together on diagnosing goal situations, planning action for the group and evaluating the reasons for success and failure.

SUMMARY

A person applying the force field technique in diagnosing a problem and/or deriving the most appropriate solution will have completed the following process steps:

1. Identified a problem/goal
2. Stated a problem applying all criteria
3. Listed forces for and against in proper form
4. Rated forces in numerical scales
5. Ranked forces in numerical scales
6. Gathered data about problem
7. Evaluated data and derived other forces, etc.
8. Derived and stated appropriate solution strategy
9. Evaluated solution effectiveness

SUMMARY FOR CRITERIA OF RANKING AND RATING

Ranking

A. Importance is defined as significance. How important or significant is a force in yielding the most movement toward the goals?

Rating

A. Strength refers to resistance to change. How strong is a force in changing a situation? Is it hard, medium or easy?

B. Clarity refers to evidence. What evidence is there that it is a force? How clear is it that it is a force?

SUBSET 8 63 Minutes

DEVELOPING A PROBLEM FOCUS

NOTES TO PARTICIPANTS

The key to this exercise is for participants to develop a problem focus that meets the stated criteria. For some, this is a tough job. Encourage them to keep working on it.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 8

2. PARTICIPANT MATERIALS

    8.1 Developing a Problem Focus
    8.2 Question Types
    8.3 Categorizing Questions
    8.4 Criteria and Guidelines for Building a Problem Focus

    One set of NCR paper

SUBSET 8

RATIONALE	MINUTES	SCHEDULE
a)	3	a) Introduce Subset 8; show SCHEDULE OF ACTIVITIES
b) Participants need a definition of a problem focus before they can develop their own. Since the focusing question to be used is of a specific nature, the participants will need to be able to differentiate different question types.	6	b) Ask participants to read HANDOUT 8.1. Developing A Problem Focus, and HANDOUT 8.2, Question Types.
c)	10	c) Give directions for HANDOUT 8.3, Categorizing Questions.

LEADER INPUT

a) Inquiry, to be productive, must have a topic or focus. The focus setting move is intended to identify such a topic. Once students become aware that inquiry is a legitimate and valued process for learning in the classroom and once the conditions are established, students will identify their own problems for inquiry. Initially, however, the teacher needs to provide several problem focuses as a means of establishing the conditions and as a way to make it possible for students to begin using the inquiry process for developing personal knowledge in the classroom.

The objective for this exercise is for each participant to develop a problem focus containing a real-life problem event and a focusing question. THE PROBLEM EVENT SHOULD CONTAIN A CONTRASTING SITUATION, AND THE FOCUSING QUESTION SHOULD BE A CONVERGENT QUESTION.

You will be:
1. Reading a description of a problem focus
2. Differentiating question types
3. Reading examples of problem focuses
4. Developing your own problem focus

b) To begin, you will be reading HANDOUT 8.1, Developing a Problem Focus, and 8.2, Question Types. When you finish reading, be able to name to yourself the different question types. (Time 6 minutes)

c) HANDOUT 8.3 asks you to classify a number of questions as description, explanation, expansion or evaluation. When you finish classifying, an Answer Sheet is provided to check your answers. If you disagree with an answer on the answer sheet, discuss it with a member of your trio. (Time 10 minutes)

RATIONALE	MINUTES	SCHEDULE
d) Participants need to be able to develop their own problem focuses for the classroom if they are ever to apply workshop learning in other settings. Further, if participants are to use their workshop learning and make changes in their own classroom behavior, they will need to be able to identify and provide events for inquiry.	32	d) Refer to HANDOUT 8.4, Criteria and Guidelines for Building a Problem Focus; give directions for building a problem focus and for checking with a partner from the small group.
e) Participants are capable of determining if a problem focus meets the stated criteria and will provide feedback data to the writer of the problem focus.	11	e) Ask participants to check development with partner.
f)	1	f) Give directions on use of first problem focus and continual development of others.

LEADER INPUT

d) HANDOUT 8.4 explores some guidelines for developing a problem focus and provides examples developed by previous workshop participants. Read over the information and start building your own problem focus using the NCR paper provided.

Pick a topic, curriculum area or subject you are interested in and know something about. It helps if the topic you select is of interest to the age group of pupils with whom you will be practicing. Then, begin to identify some events within the topic that have contrasts. Use an explanation question to pinpoint the contrast.

After you have had a chance to work for 30 minutes, I'll ask that you check your planning and your idea with another member of your small group. CHECK WITH HIM TO MAKE SURE THAT YOUR PROBLEM FOCUS IS MEETING THE ESTABLISHED CRITERIA. Identify for him the kinds of help and suggestions you need.

Go ahead and begin by reading HANDOUT 8.4. (Time 30 minutes)

e) Stop your development work for the time being and take 10 minutes to check your planning with a member of your small group. Indicate to him the kind of help he can give. (Time 10 minutes)

f) You will be using the problem focus just developed in the next exercise. At this point it may be in very rough form. You may be lacking some visuals or materials needed to make it complete. Or you may be still working to get a good event with a contrast. However, you will use it in whatever shape it is. You will be trying it out with your small group here in the workshop. This way, you can get a feel of how others respond to the problem focus and begin to use some tactical moves in response to the inquirers. It may be that your problem focus will be given verbally. This is fine.

You will need to develop four problem focuses for use during the workshop. Since their use in the workshop will be spread out between now and the end, you have time to continue developing and revising your efforts. You may find it desirable to consult some of your own planning guides or texts. Observing the classroom for questions that students raise is often fruitful. Check to see that your problem focuses meet the stated criteria:

1. Event With a Constrast
2. Explanation Focusing Question

Inquiry is occurring when:

1. Students are explaining a cause-effect relationship
2. Evidence (data) is valued as the basis for judgment (theory)

But students have to be developing explanations about something; there must be a situation that needs explaining. This exercise is to demonstrate how such a situation can be developed and presented for classroom inquiry. The situation is called a PROBLEM FOCUS. Students are very able to identify their own situations to explain. They do it all the time except they usually don't have much chance for this in the classroom. So, to make it more likely to happen in the classroom, the task here is to learn how to develop problem focuses and present them in the classroom. Eventually, once students get the idea that the classroom is a place where one inquires, they will identify their own problem focuses and the teacher can join in the fun of developing his own explanation, along with all the other students.

The problem focus has two parts, the EVENT and the FOCUSING QUESTION. The event is nothing more than a "happening" containing contrasting situations, events or circumstances. It is selected to be "real life" (events need to be concrete, especially for young children) and within the understanding and interest of the student group. It identifies the context of the "happening" and sharpens the scope of the inquiry topic. The contrasting elements within the event are included to present a discrepancy which becomes intellectually and psychologically unsettling or puzzling. Thus, an event is something that students are interested in and recognize. It identifies the topic for investigation and stimulates the students to take action.

The focusing question accompanies the event and is asked after the presentation of the event. It is put to the students to pinpoint the contrast within the event and to illuminate the meaning to be generated through inquiry.

For an example, see the problem focus containing an EVENT and a FOCUSING QUESTION which appears on the next page.

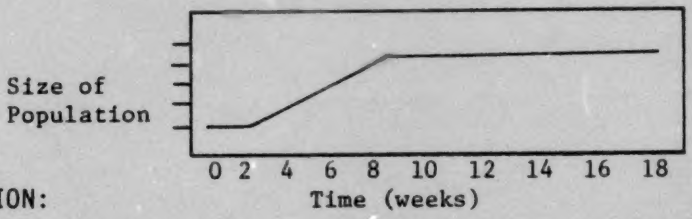
Developing a Problem Focus Handout 8.1

TEACHER

PROBLEM FOCUS

EVENT: Identifies happening and contains contrasting situation.

"Health Department officials were attempting to determine the increase of the mouse population in an old, downtown office building. Each day they placed 250 grams of food in the building where the mice could get it. Live traps were placed throughout the building and baited. By counting the number of mice trapped each day they could compute the increase or decrease of the population. After two weeks, the mouse population increased steadily until at the end of eight weeks, the population had tripled. However, for the next ten weeks the mouse population remained the same."



FOCUSING QUESTION: Pinpoints the contrast and illuminates the meaning to be generated through inquiry

"Why did the mouse population grow steadily and then stop?"

The focusing question the teacher uses is a critical part of the problem focus. The intent of the focusing question is to pinpoint the conflict within the event and define the meaning to be generated through inquiry. Our definition of inquiry clearly establishes the meaning to be generated:

1. Explanation of a cause-effect relationship
2. Evidence (data) used as the basis for judgment (theory)

In the example above, the teacher did not ask as a focusing question, "How much more did the population increase from the second to the eighth week and from the eighth to the sixteenth week?" Although the question would have helped to pinpoint the contrasting situations in the event, it would not have illuminated the kind of meaning we are generating through inquiry.

This question does not ask students to deal with a cause-effect relationship using evidence as a basis for judgment. It calls only for the recall or identification of a specific fact or piece of information. Nor would the question, "Do you think this study was important?" have served as a focusing question. Actually, this question fails on both counts. It does not directly reveal the contrasting situations in the event. And more important, it does not allow students to generate the essential meaning of inquiry. The question simply asks for a statement of personal choice.

The FOCUSING QUESTION, to a large extent, determines whether or not inquiry is to take place. We are going to look at question types as a starting point in developing a problem focus.

Gallagher and Aschner have developed a system which identifies four categories of questions asked by teachers.

DESCRIPTIVE QUESTIONS: These questions ask for recall of specific facts, information or descriptions, involving rote memory, or observation on the part of the student. Students are asked only to give it, not do anything with it.

1. What is the capital of Oregon?
2. What kind of automobile do you own?
3. What did you see in the picture?
4. What are the major products of Oregon?

EXPLANATION QUESTIONS: These are questions which call for analysis and integration of information and/or data that is given, remembered or generated. The answer to this type of question requires the logical use of information or fact as data in building and testing theories and explanations.

1. Why is Salem the capital of Oregon?
2. Why do more people own Fords than Lincolns?
3. Why are the animals different colors?
4. Why is timber Oregon's major industry?

EXPANSION QUESTIONS: These are questions which call for creativity and imagination. They do not call for necessarily logical answers, but free the student to use whatever information he wants in ways that he feels is relevant.

1. What would happen if Oregon were to choose a new capital site?
2. What would you do to have more people buy Lincolns?
3. What might the schools do to keep some animals from becoming extinct?
4. What might Oregon do to improve its economy?

EVALUATIVE QUESTIONS: These are questions that deal with "judgment, value and choice." The student states his preference based upon his values. He can respond with a yes or no.

1. Would you prefer to have the capital of Oregon in Salem or Portland?
2. Do you feel the new car colors are attractive?
3. Do you feel that big game hunting should be abolished?
4. Should Oregon share its water with California?

Gallagher and Aschner indicate that the kind of questions asked by the teacher determines the type of student response.

DESCRIPTIVE QUESTIONS solicit recall or observational responses of information, fact or descriptions.

EXPLANATION QUESTIONS solicit theorizing responses calling for the use of information or fact to establish logical, causal relationships.

EXPANSION QUESTIONS solicit exploratory responses calling for the use of information or fact in creative or imaginative ways to build new relationships.

EVALUATIVE QUESTIONS solicit responses which reveal a personal bias or preference based on the individual's values.

Place each of the teacher questions below into one of the following categories:

DESCRIPTION
EXPLANATION
EXPANSION
EVALUATION

After you have classified the questions, use the attached answer sheet to help assess your efforts.

______________ 1. What is 4 times 2?

______________ 2. Should students of this school promote racial integration?

______________ 3. What could be done to eliminate the garbage problem in New York?

______________ 4. In what state is Crater Lake?

______________ 5. Why does the air feel cold?

______________ 6. What would you do to increase food production in Asia?

______________ 7. What form of transportation would you use to travel around the world if you had your choice?

______________ 8. What is the largest city in the South Pacific?

______________ 9. Why do Arabs wear long flowing robes?

______________10. Why are the Rockies so jagged and steep?

______________11. How would you change the story to make the reader feel afraid?

______________12. Do you like the painting?

______________13. What colors are in the French flag?

______________14. Do you think Congress should change the design of the American flag?

______________15. Why did he murder his wife?

______________16. Why did he drop out of school?

______________17. Why does Jim always come late to class?

______________18. What is this object called?

______________19. What would you do to keep the Columbia River from flooding?

______________20. Which do you prefer, essay exams or true/false exams?

ANSWER SHEET FOR CATEGORIZING QUESTIONS

Handout 8.3

DESCRIPTION
EXPLANATION
EXPANSION
EVALUATION

1.	DESCRIPTION	Teacher is asking for recall of fact.
2.	EVALUATION	Teacher is asking for judgment based on value; would change to EXPANSION if teacher asked, "What would you do to promote racial integration?"
3.	EXPANSION	Teacher is asking for creative ways of handling a situation which calls for use of information and facts of situation; would change to EXPLANATION if teacher asked, "What caused the New York garbage problem?"
4.	DESCRIPTION	Teacher is not asking student to do anything with facts; asking only for recall of fact.
5.	EXPLANATION	Teacher is asking for logical explanation; would change to EXPANSION if the teacher asked, "What could be done to make the air feel warmer?" Would change to EVALUATIVE if teacher asked, "Do you like the cold?" Would change to DESCRIPTION if teacher asked, "What was yesterday's temperature?"
6.	EXPANSION	Teacher is asking student to explore creatively ways of dealing with a situation; would change to EXPLANATION if teacher asked, "Why is there a shortage of food in Asia?"
7.	EVALUATION	Teacher is asking for student preference based on his values; would change to EXPLANATION if teacher asked, "Why do most people tour the world by air?"
8.	DESCRIPTION	Teacher is asking for recall of a fact or report of an observation (like of a map).
9.	EXPLANATION	Teacher is asking for students to use information to explain.
10.	EXPLANATION	Teacher is asking for a logical explanation based on information that the student would have to use.
11.	EXPANSION	Teacher is asking for imaginative use of relationships which may not be logical or conventional in relation to grammar, syntax or structure. Would change to EXPLANATION if teacher asked, "Why does this passage make you feel afraid?"

Answer Sheet for Categorizing Questions

Handout 8.3

12.	EVALUATIVE	Teacher is asking for student's preference or choice; would change to EXPANSION if the teacher asked, "What would you do to create a stronger line in this picture?" Would change to EXPLANATION if the teacher asked, "Why does a Miro painting sell for more than a Larry Schwartz painting?"
13.	DESCRIPTION	Teacher is asking for recall of a fact or to describe what is being observed.
14.	EVALUATIVE	Teacher is asking for the student's personal preference; would change to EXPLANATION if the teacher asked, "Why are people against changing the design of the American flag?" Would change to EXPANSION if the teacher asked, "What would happen if the United States changed the design of its flag?"
15.	EXPLANATION	Teacher is asking for use of information to explain cause. Would change to EXPANSION if the teacher asked, "How could the murder have been prevented?"
16.	EXPLANATION	Teacher is asking students to gather facts and information which caused dropout. Would change to EXPANSION if the teacher asked, "What would you do to prevent student dropouts?" Would change to DESCRIPTION if the teacher asked, "How many students dropped out of high school in 1968?"
17.	EXPLANATION	Teacher is asking for logical explanation requiring use of information and facts; would change to EXPANSION if the teacher asked, "What would you do to have Jim come to class on time?" Would change to EVALUATION if the teacher asked, "Do you like this class?" Would change to DESCRIPTION if the teacher asked, "How many times was Jim late this year?"
18.	DESCRIPTION	Teacher is asking for recall of a name or label.
19.	EXPANSION	Teacher is asking for creative use of information and facts. Would change to EXPLANATION if the teacher asked, "Why does the Columbia flood some years and not other years?"
20.	EVALUATIVE	Teacher is asking for personal choice.

CRITERIA AND GUIDELINES FOR BUILDING A PROBLEM FOCUS

It is the EXPLANATION question that becomes the focusing question for the problem focus. This is the kind of question that calls for students to develop a cause-effect relationship.

Below are some problem focuses that previous workshop participants developed. These meet the criteria of a problem focus. The criteria are:

1. An event with a contrasting situation(s)
2. A focusing question which is an explanation question

It is important to note that in problem focuses developed for young (primary) children, the event should be concrete. That is, the children can use their senses to gather data. This seems critical. Where children are presented events in symbolic form, like talking (language) or in other abstract forms like a drawing, chart or picture they are limited in what they can do to gather data. Under these circumstances they can only gather data through language. This is difficult for them. However, when they can get their hands on things it is a different situation. Here, the teacher may not get the verbal data generating actions but will find children gathering data with their hands, ears, eyes, etc.

Also notice that where the teacher presents a problem focus only through language (talking), the language he uses is descriptive (e.g., Items 4, 11, 12). That is, he uses words to describe accurately the constituent elements of the event. He does not use words that are inferential or judgmental. Descriptive language was used to convey the school anecdotes in Subset 6. Words such as bad, defiant, rowdy, cheater, dependent, etc., were not used. These words are not descriptive of what is going on in an event. These words are inferential and judgmental.

SAMPLE PROBLEM FOCUSES

1. Junior High School

The class had been out on six different occasions during the year observing a small farming operation. The teacher asked the group to watch the irrigation operation where they were siphoning water out of a nearby stream. The students noticed that during the winter, the siphon was placed near the bottom of the stream. During the summer, the siphon was placed almost on the surface.

The teacher asked the students to explain:

> Why does the farmer have his siphon at one level of the stream in the winter and at a different level in the summer instead of just leaving it at one level?

(This problem focus grew directly out of the students' experience. The teacher simply used the concrete event as a problem focus.)

2. First Grade

The students had been observing different animals, particularly their teeth. They noticed that teeth of the dog, cat, human, horse, cow, mouse were different.

The teacher raised the question?

> Why are the teeth so different?

(This problem focus grew directly out of the students' experience. The teacher simply used the results of their observations to identify a problem focus.)

3. Sixth Grade

The teacher brought in a newspaper article and picture showing a record size cabbage had been grown in Alaska. The cabbage was two and one-half feet in diameter.

The teacher asked:

> How would you explain a cabbage of this size being grown in Alaska?

(For youngsters living in the Matanuska Valley this would not be too discrepant. However, for the youngsters who encountered the problem focus in the workshop and for the teacher who used it, the event was discrepant on two counts: first a cabbage that size and, second, a cabbage that size coming from Alaska.)

4. Sixth Grade

Teacher said the following to the group:

For more than 150 years the capitol city of Brazil had been Rio de Janeiro. In 1956 a new capitol city was begun 150 miles from the nearest road or railroad.

Why did Brazil build a new capitol city?

5. High School

The teacher passed out mimeographed copies of the poem, "Do Not Go Gentle Into That Good-Night" by Dylan Thomas and asked the students to read it.

The teacher raised the question:

> Why did he bother to write this?

(Some argued that this problem focus failed to meet one of the criterion, that of having a contrast within the event. Others argued that the event, the poem, when juxtaposed with other written material or with other poems, is in itself a contrast.)

6. Third Grade

The teacher, referring to the chalkboard, says:

> There are two columns of words on the chalkboard. I took them from the papers you did yesterday. In Column A the words are spelled correctly. In Column B the words are spelled incorrectly.

A	B
stopped	carryd
poked	runing
painted	peckked
patted	peepped
cutting	diging
bending	bating

Why are the words in Column B spelled incorrectly and those in Column A spelled correctly?

7. Upper Elementary

Teacher explained to the class:

> Two boys were given this problem. "Here are some rows and columns of numbers. Down below are some problems to solve using these numbers and others that you may want to add. Look at number 1 so that I can explain how the problems work. The problem says that you begin at 2 and go in the direction of the arrow, 2 more numbers. This would take you to 4. You see, the direction of the arrow tells you which way to go and the number in parentheses tells you how many more numbers you move to. So now you are on 4 and you go up 3 more numbers. This puts you on 22. Then you go down 1 more number. Now you are on 16. Then, left 2 more numbers and you land on 14. Fourteen is your answer and you write it in after the equal sign. Now work all the problems and then tell me how you did them."

19	20	21	22	23	24
13	14	15	16	17	18
7	8	9	10	11	12
1	2	3	4	5	6

Problems:

1. 2 →(2), ↑ (3), ↓ (1), ←(2) = 14
2. 8 ↓ (1), →(3), ↑ (2), →(1) =
3. 5 ↖ (2), ↓ (1), →(2) =
4. 15 ↑ (2), ↗ (1), ↓ (3) =
5. 23 ↓ (2), ↖ (4), →(2) =
6. 16 ↑ (5), ↗ (1) ↓ (3), →(1) =

After the boys had worked the problems they explained to the teacher what they had done. One boy said that in order to work some of the problems he had to write in more numerals. The other boy said he could work the problems without writing in the other numbers. Both boys got all the problems correct.

The teacher then raised the question:

> Why could one boy work the problems without writing in additional numerals?

8. Primary

The students had the use of a magnet and a variety of small objects such as paper clips, plastic hairpins, coins, rubber bands, washers, juice can tops and thumb tacks. They were asked to see what the magnet would pick up.

The teacher raised the question:

> Why does the magnet pick up some things but not others?

9. High School Geography

The teacher had a large map showing the forrested areas of the United States.

The teacher raised the question:

> Why are there so few trees on the Great Plains?

10. Adult Homemaking Class

Two of the students had made angel food cakes. One of the cakes had turned out to be high, light and round. The other cake was caved in on one side and soggy.

The instructor raised the question?

> Why did one cake get high and round and the other one flat and soggy?

11. High School and Adult Education

The teacher said:

> An earthworm's heart works at 17 beats per minute
> A toad's heart at 45 beats per minute.
> A mouse's heart at 624 beats per minute
> An elephant's heart at 37 beats per minute
>
> Why does the mouse's heart beat so fast?

12. Adult Education

The teacher said:

> On the sixth of August, 1945, the United States dropped a single atomic bomb on Hiroshima, Japan. It exploded with a force equivalent to 20,000 tons of TNT. Some 84,000 persons died as a result of the blast. When the bombing was ordered by the then President of the United States,

Harry S. Truman, he had information the Japanese Government was willing to negotiate a peace settlement with the Allies. This information had been obtained by US intelligence agencies which had been able to decipher the secret Japanese diplomatic code as early as 1941.

Why was the decision made to use the bomb?

SUBSET 9 111 Minutes
USING ALLOWING INQUIRY MOVES

NOTES TO LEADERS

At Activity (c), make sure each observer knows how he will be tallying.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 9
2. Tape recorder with TAPE C-II ready to play right before the teacher presents problem focus
3. Pulse glasses available
4. Inquirer letter/labels ready for distribution
5. Arrangements completed for participants to work with students
6. Chart or overhead transparency of group seating arrangement for making tape, page 386
7. PARTICIPANT MATERIALS

    9.1 Directions for Observer Guide
    9.2 Observer Guide: Inquirer Actions and Appropriate Leader Response
    9.3 Directions for Completing Time Interval Sheet
    9.4 Producer's Time Interval Sheet

SUBSET 9

	RATIONALE	MINUTES		SCHEDULE
a)	Participants need to have a "safe" try at using their own problem focus in order to assess how effective it is with a group of inquirers.	3	a)	Introduce Subset 9. Show SCHEDULE OF ACTIVITIES.
b)	At this point, participants are ready to look at the appropriateness of teacher response in relation to inquirer actions. The observer guide will make it possible for them to report accurate teacher, student behavior.	3	b)	Refer to HANDOUTS 9.1 and 9.2; allow participants to read. Get TAPE C-II ready.
c)		6	c)	Give directions for using Handout 9.2. Play first 5 minutes of Tape C-II for practice.

LEADER INPUT

a) For this exercise each participant will:

1. Present his first problem focus to members of his small group for inquiry and practice using only allowing inquiry moves in response to inquirers
2. Use a guide sheet to assess the degree to which the leader responds appropriately to the inquirer actions
3. Receive feedback on the degree to which he was able to respond appropriately to inquirers

The leader is attempting to gain skill in using only the allowing inquiry moves in response to inquirer actions on a problem focus which he has developed. This is a practice session before making a practice tape in the classroom.

Observers will be trying to tally as accurately as possible the appropriateness of the leader responses. They will report their observations to the leader. In this manner the leader can make decisions about what he will continue to do or what he will change as he practices with students in the classroom.

b) Observers for this exercise will be using HANDOUT 9.2. Directions for its use are on HANDOUT 9.1. YOU WILL NOTICE THAT THE KEY TASK OF THE OBSERVER IS TO JUDGE IF THE LEADER RESPONSE IS APPROPRIATE TO AN INQUIRER ACTION. The observer must listen and identify the inquirer action. Then, he must listen and identify the leader response. Take 3 minutes to read over the directions and the guide.

[Prepare TAPE C-II to start where the teacher is presenting the problem focus.] (Time 3 minutes)

c) So that you can get some practice using the Observers Guide, we will play the first 5 minutes of Tape C-II and let you try tallying. You can begin with the first student action on the tape. Since there is no way of identifying the inquirers on the tape, do not be concerned with the columns marked Inquirer A, B, C, D. Do all coding in the Inquirer A column.

[Stop the tape after each inquirer-leader response to let participants tally on Handout 9.2.] (Time 6 minutes)

SUBSET 9

RATIONALE	MINUTES	SCHEDULE
d)	2	d) Explain leader, observer, inquirer tasks in small groups and explain rotation procedure within each small group.
e)	3	e) Ask participants to set up small groups, prepare tape recorders and get letter/labels on inquirers.
f) Participants need another safe try at using the allowing inquiry moves with their own problem focus, before working in the classroom. This practice will result in increased confidence and skill in responding to inquirers.	7	f) Begin first practice round.
g)	8	g) Stop inquiry and ask observers to report.

LEADER INPUT

d) The small groups will work just as they did in Subset 6 where they were using the anecdote as a problem focus. There will be three tasks in each group: leader, observer and inquirer. The leader will be presenting his problem focus and practicing appropriate responses to inquirer actions, using only the allowing inquiry moves. Those in the task of inquirer will respond to the problem focus as they see fit. The observers will use the guide you've just reviewed. For each practice round, there will be 1 leader, 2 observers and the remainder of the group will be inquirers. Inquirers will wear the letter/labels so observers can tally individual actions. Leaders should identify inquirers by letter. Each leader will be tape recording his practice efforts; he should arrange his group to get a clear tape.

For each round there will be 7 minutes for inquiry and 8 minutes for observer reports. Tallying by individual inquirers will enable the observers to compare their tallies more accurately and will help the leader pinpoint specific responses for further analysis.

e) Take 3 minutes now to set up your small groups. Arrange your chairs in a horseshoe so the inquirers will be within arm's length of the leader. A leader for the first round should volunteer and the inquirers should pin on their letter/labels. Tape recorders should be ready to go. [Refer to chart or transparency for diagram of small group structure.] (Time 3 minutes)

f) Leaders for the first round, please begin. (Time 7 minutes)

g) Stop. One observer should report to the leader followed by the second observer. Observers report by reading down their observation guides, informing the leader of appropriate and inappropriate responses and to whom the responses were made. They should also report on Item 6 of the directions, "Did the problem focus meet the stated criteria?"

Where observers differ widely, they should identify the inquirer to whom the responses were made and locate the incident on the tape. All members of the small group could then respond to the incident, attempting to clarify what really took place. Observers should give their observation guides to the leader and the leader should keep his tape. He will use both the guides and the tape to analyze his efforts. (Time 8 minutes)

SUBSET 9

RATIONALE	MINUTES	SCHEDULE
h)	7	h) Stop observers and ask participants to shift tasks for the second round.
i)	8	i) Stop inquiry in the second round and ask observers to report. (Repeat the reporting directions.)
j)	15	j) Stop observers and ask participants to shift tasks for the third round. Observers report after 7 minutes.
k)	45	k) Repeat procedure for remaining rounds, stopping to ask for observer's report and to start next round. Have break after third round.
l)	2	i) Call participants together.
m) Participants are ready to try their first tape in the classroom. The Observer Guide will enable the participant to assess his own efforts and provide data necessary for him to improve his efforts.	2	m) Give directions for participants to tape their efforts while working with students and preparing the producer's time interval sheet. (Transparency, page 391)

LEADER INPUT

h) Observers, please stop reporting. It is time to shift tasks for the second round. (Time 7 minutes)

i) Stop. Observers, please report. (Time 8 minutes.)

j) Observers, please stop reporting. Now, rotate tasks in each group for the third round. (Time 15 minutes)

k) [Start and stop inquiry and observer reports for each of the remaining rounds. Provide a break after the third round.] (Time 45 minutes)

l) Let's all meet together as a group again.

m) Your next task will be to produce a tape recording of yourself where you are allowing students to inquire using only the allowing inquiry moves. The tape need only be 15 minutes. You may use a problem focus that you developed here in class or you may use one of the pulse glasses. You will be bringing the tape you produce back for the next workshop activity. Members of your trio will listen to your tape with you and, using an observer guide similar to the one just used, report to you on the degree to which you were able to respond appropriately. In order for observers to identify the portions of the tape for which they are tallying, will you, after making your tape, listen to it and complete the Producer's Time Interval Sheet, HANDOUT 9.4. Directions for completing this sheet are on HANDOUT 9.3. Have your tape and the time interval sheet ready for the next activity.

After listening to your tape to complete the producer's time interval sheet, you may wish to listen to it again using Observer Guide, HANDOUT 9.2.

PRACTICE USING YOUR RECORDER PRIOR TO MAKING YOUR TAPE. A TAPE THAT CANNOT BE HEARD WILL BE OF LITTLE USE. TO GET A GOOD RECORDING, ARRANGE STUDENTS AS YOU HAVE ARRANGED YOURSELF HERE IN THE ENACTMENT LESSONS. [Show chart of group arrangement.]

DIRECTIONS FOR OBSERVER GUIDE

Handout 9.1

1. Read down the first column to become familiar with the inquirer actions.
2. Read down the second column to become familiar with the appropriate leader responses.
3. Observe the interaction between student and leader:
   a. Identify the action of a specific student from the first column.
   b. Judge appropriateness of the leader response to student action.

      [Is the leader response one of those adjacent to the identified student response?]
4. Tally appropriateness of the leader response in the column identifying the correct inquirer.
   a. Use a plus sign (+) if the leader response is appropriate.
   b. Use a minus sign (-) if the leader response is inappropriate.
5. Proper tallying is important because:
   a. All observer(s) tallies will be compared.
   b. Leaders need to be aware of the appropriateness of their response to student actions.
6. Consider correlation of problem focus with established criteria:

   Does the problem focus meet the established criteria?

   Yes _____

   No _____ Identify the areas where the problem focus does not meet the established criteria.

OBSERVER GUIDE: Inquirer Actions and Appropriate Leader Responses

Handout 9.2

INQUIRER ACTIONS	APPROPRIATE LEADER RESPONSE	Inquirer A	Inquirer B	Inquirer C	Inquirer D
EXPLANATION ACTIONS: The student makes an analogy, necessity and/or synthesis statement about the problem event.	CLARIFYING ACCEPTING STRUCTURING				
VERIFICATION ACTIONS: The student verifies an event, object, condition of object and/or property of object which relates to an identified inquiry problem focus.	CLARIFYING RESPONDING TO DATA PROBE				
EXPERIMENTATION ACTIONS: The student experiments with an event, object and/or condition of object which relates to an identified inquiry focus.	CLARIFYING RESPONDING TO DATA PROBE				
THEORETICAL DATA STATEMENT: The student shares an observation, belief and/or off-the-cuff prediction while thinking out loud.	CLARIFYING ACCEPTING				
PROBLEM FOCUS QUESTION: The student poses a question that identifies a problem for inquiry.	CLARIFYING FOCUS SETTING				
OTHER student behavior not classifiable in above categories.					
DIFFICULT to hear or cannot tell what action the student is taking.					

OBSERVER GUIDE: Inquirer Actions and Appropriate Leader Responses

Handout 9.2

INQUIRER ACTIONS	APPROPRIATE LEADER RESPONSE	Inquirer A	Inquirer B	Inquirer C	Inquirer D
EXPLANATION ACTIONS: The student makes an analogy, necessity and/or synthesis statement about the problem event.	CLARIFYING ACCEPTING STRUCTURING				
VERIFICATION ACTIONS: The student verifies an event, object, condition of object and/or property of object which relates to an identified inquiry problem focus.	CLARIFYING RESPONDING TO DATA PROBE				
EXPERIMENTATION ACTIONS: The student experiments with an event, object and/or condition of object which relates to an identified inquiry focus.	CLARIFYING RESPONDING TO DATA PROBE				
THEORETICAL DATA STATEMENT: The student shares an observation, belief and/or off-the-cuff prediction while thinking out loud.	CLARIFYING ACCEPTING				
PROBLEM FOCUS QUESTION: The student poses a question that identifies a problem for inquiry.	CLARIFYING FOCUS SETTING				
OTHER student behavior not classifiable in above categories.					
DIFFICULT to hear or cannot tell what action the student is taking.					

OBSERVER GUIDE: Inquirer Actions and Appropriate Leader Responses

Handout 9.2

INQUIRER ACTIONS	APPROPRIATE LEADER RESPONSE	Inquirer A	Inquirer B	Inquirer C	Inquirer D
EXPLANATION ACTIONS: The student makes an analogy, necessity and/or synthesis statement about the problem event.	CLARIFYING ACCEPTING STRUCTURING				
VERIFICATION ACTIONS: The student verifies an event, object, condition of object and/or property of object which relates to an identified inquiry problem focus.	CLARIFYING RESPONDING TO DATA PROBE				
EXPERIMENTATION ACTIONS: The student experiments with an event, object and/or condition of object which relates to an identified inquiry focus.	CLARIFYING RESPONDING TO DATA PROBE				
THEORETICAL DATA STATEMENT: The student shares an observation, belief and/or off-the-cuff prediction while thinking out loud.	CLARIFYING ACCEPTING				
PROBLEM FOCUS QUESTION: The student poses a question that identifies a problem for inquiry.	CLARIFYING FOCUS SETTING				
OTHER student behavior not classifiable in above categories.					
DIFFICULT to hear or cannot tell what action the student is taking.					

DIRECTIONS FOR COMPLETING THE TIME INTERVAL SHEET

Handout 9.3

Handout 9.4 will be used for the next workshop activity. It will help identify different time intervals on the practice tape for the observers while they tally student-teacher responses. During their report to each producer, the observers will be able to correlate their tally marks with particular portions of the practice tape.

After your practice tape has been produced, listen to it and then use Handout 9.4 to divide the tape into five, 2-minute periods.

1. Replay the tape and use the first student response following the problem focus as the beginning of the first period.
2. Record this statement or question under Time Period 1, "Period begins with." Write enough of the statement to identify this point on the tape.
3. Using a watch to keep time, allow the tape to run for two minutes.
4. Stop the recorder and write the statement that denotes the end of Time Period 1, "Period ends with."
5. Use the next student statement or question on the tape to identify the beginning of the second time period. Write enough of this statement to identify this point on the tape, Time Period 2, "Period begins with."
6. Again allow the tape to run for two minutes and record the statement that ends Time Period 2, "Period ends with."
7. Continue to do this for Time Periods 3, 4 and 5.

Try to have the end of the time period correspond with the end of an interaction unit between teacher and student. For instance, if the student is asking a question or making a statement, try not to end the time period without getting the teacher's response.

PRODUCER'S TIME INTERVAL SHEET

Handout 9.4

Date____________________________________

Producer's Name__________________________

Time Period (Two minutes each)	Period Boundaries
1	Period begins with: Period ends with:
2	Period begins with: Period ends with:
3	Period begins with: Period ends with:
4	Period begins with: Period ends with:
5	Period begins with: Period ends with:

SUBSET 10 56 Minutes
ASSESSING FIRST PRACTICE TAPE

NOTES TO LEADERS

Leaders should make sure trios are spread out enough so recorder noise from one trio does not disturb another. This may mean the leader must move around to different trios to stop and start them for various rounds.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 10
2. PARTICIPANT MATERIALS
    - 10.1 Directions for Listener Guide
    - 10.2 Listener Guide: Inquirer Actions and Appropriate Leader Response

SUBSET 10

RATIONALE	MINUTES	SCHEDULE
a) Participants must get an assessment of their ability to use the allowing inquiry moves consistent with inquirer actions if they are to maintain the conditions of focus, freedom and responsive environment in their own classrooms.	3	a) Introduce Subset 10. Show SCHEDULE OF ACTIVITIES.
b) Workshop participants can provide one another with such an accurate assessment by using the observation guide. Some participants will already have generalized the appropriate teacher moves in response to inquirer actions. Others will reach this generalization simply by using the observation guide itself.	2	b) Refer to HANDOUTS 10.1 and 10.2. Ask participants to review.
c)	1	c) Give directions for using Time Interval Sheet.
d) The use of two observers insures reliability in the identification of teacher moves, inquirer actions and in the data reported to the producer.	12	d) Give directions for trio members to play practice tapes and for listeners to report.

LEADER INPUT

a) For this exercise you will:

1. Play your practice tape in your trio
2. Use a guide to assess the degree to which the producer of the tape responded appropriately to inquirer actions with allowing inquiry moves

The objective is to provide as accurate data as possible to the producer.

b) Listeners will be using HANDOUT 10.2 following the directions on HANDOUT 10.1. The items on the guide are identical to those on HANDOUT 9.2. However, the column headings for tallying are revised.

Take two minutes to read the directions and review with the guide. (Time 2 minutes)

c) You notice that the listeners will be tallying by time periods. Each of you have completed a Time Interval Sheet that denotes the different time periods on the guide. As the producer plays his tape, he will have his time interval sheet in front of him. As the tape plays, he will listen to the tape and observe his time interval sheet so that he can tell listeners when to begin tallying in another time period column. He can talk over the tape to tell them, "Go to the next column" or he can stop the tape to tell them.

d) One member of the trio should volunteer to play his tape. He is called the producer. The other members are listeners and will use Handout 10.2. Since the listeners are attempting to determine the appropriateness of the leader responses, the leader should stop the recorder after each teacher response to an inquirer. LISTENERS, YOU WILL LISTEN FOR THE STUDENT ACTION AND IDENTIFY IT. THEN LISTEN FOR THE LEADER RESPONSE AND IDENTIFY IT. IF IT IS APPROPRIATE, MARK A PLUS (+) IN THE PROPER TIME INTERVAL COLUMN, IF NOT MARK A MINUS (-). Mark your guide sheets independently. After listeners mark, the producer starts the recorder for the next student action and teacher response. You will have 7 minutes for playing a practice tape and 8 minutes for listeners to report the appropriateness of teacher responses.

SUBSET 10

RATIONALE	MINUTES	SCHEDULE
d)		d) Continued
e)	8	e) Stop tape playing and ask listeners to report.
f)	7	f) Stop first round reporting and ask trio member to start second round.
g)	8	g) Stop tape playing and ask second round listeners to report.
h)	7	h) Stop second round reporting and ask trio member to start third round.
i)	8	i) Stop tape playing and ask third round listeners to report.

LEADER INPUT

d) Listeners should report to the producers one at a time telling the number of appropriate and inappropriate teacher responses. Where listeners' reports differ, the differences should be located on the handout and traced to the tape by referring to the time interval where the difference exists. The producer can locate the difference on the tape. Together, trio members can discuss the appropriateness of leader response. The idea is to help the leader complete the exercise with a better idea of the appropriateness of his responses. The listeners give their tally sheets to the producer so he can review his practice efforts later if he chooses.

[SPREAD OUT SO THE RECORDERS DO NOT INTERFERE WITH ONE ANOTHER. YOU CAN BEGIN THE FIRST ROUND.]

Check to see that producers are calling out time periods and starting and stopping recorders. (Time 7 minutes)

e) Listeners, please report to the producer.

[Check to see that listeners are reporting properly and repeat directions if not.] (Time 8 minutes)

f) Will the second producer play his tape? (Time 7 minutes)

g) Listeners, please report to the producer. (Time 8 minutes)

h) Will the third producer play his tape? (Time 7 minutes)

i) Listeners, please report to the producer. (Time 8 minutes)

DIRECTIONS FOR LISTENER GUIDE Handout 10.1

1. Read down the left column to become familiar with the Inquirer Action items.

2. Read down the middle column to become familiar with the Appropriate Leader Response items.

3. Listen to the tape recordings.

    a. Identify the actions of a specific student from the list of items.

    b. Judge appropriateness of the leader response to student actions:

        Is the leader response one of those adjacent?

4. Tally appropriateness of the leader response in the proper time period column.

    a. Use a plus (+) sign if the leader response is appropriate.

    b. Use a minus (-) sign if the leader response is inappropriate.

5. Proper tallying is important because:

    a. Tallies from all observers will be compared.

    b. Leaders need to be aware of the appropriateness of their response to student actions.

6. Consider correlation of problem focus with established criteria:

    Does the problem focus meet the established criteria?

    Yes_______

    No________ Identify the areas where the problem focus does not meet the established criteria.

LISTENER GUIDE: Inquirer Actions and Appropriate Leader Response

Handout 10.2

TALLY: Appropriate (+)
Inappropriate (-)
(Two-Minute Time Periods)

INQUIRER ACTIONS	APPROPRIATE LEADER RESPONSE	Time Period 1	Time Period 2	Time Period 3	Time Period 4	Time Period 5
EXPLANATION ACTIONS: The student makes an analogy, necessity and/or synthesis statement about the problem event.	CLARIFYING ACCEPTING STRUCTURING					
VERIFICATION ACTIONS: The student verifies an event, object, condition of object and/or property of object which relates to an identified inquiry focus.	CLARIFYING RESPONDING TO DATA PROBE					
EXPERIMENTATION ACTIONS: The student experiments with an event, object, and/or condition object which relates to an identified inquiry focus.	CLARIFYING RESPONDING TO DATA PROBE					
THEORETICAL DATA STATEMENT: The student shares an observation, belief and/or off-the-cuff prediction while thinking out loud.	CLARIFYING ACCEPTING					
PROBLEM FOCUS QUESTION: The student poses a question that identifies a problem for inquiry.	CLARIFYING FOCUS SETTING					
OTHER student behavior not classifiable in above categories.						
DIFFICULT to hear or cannot tell what action the student is taking.						

SUBSET 11 30 minutes
INDIVIDUAL TRIO MEMBER RATING

NOTES TO LEADERS

It is important that participants understand the shift in focus. Make this clear as well as the reason for the shift. Sometimes participants will want to rate items other than those on the scales. This is OK as long as they rate the scale items first and stay within the time limits. People have indicated some fatigue at this point so it may not be wise to extend the time limits.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 11

2. PARTICIPANT MATERIALS

    11.1 Individual Trio Member Rating
    11.2 Listening Skills

    12.2 Autonomy: Who Decides (READING ASSIGNMENT)

SUBSET 11

RATIONALE	MINUTES	SCHEDULE
a) Participants must rely on one another for accurate, open feedback; there is no "expert" to give it. Participants need accurate and open feedback if they are to assess their own growth and take the necessary steps for improvement. The ability and willingness of the individual participants to assess and confront trio and small group behavior is directly related to the amount of learning which takes place in the trio or small group. Participants will provide and accept feedback from one another on the groups' effectiveness because at this point they realize their own skill development is dependent on it.	3	a) Introduce Subset 11. Show SCHEDULE OF ACTIVITIES.
b)	3	b) Refer to HANDOUT 11.1 and ask participants to review it.
c)	4	c) Give directions for using Handout 11.1.
d)	1	d) Give directions for sharing individual ratings. Indicate a review of HANDOUT 11.2 may be necessary.

LEADER INPUT

a) IN THIS EXERCISE WE WILL AGAIN SHIFT THE FOCUS FROM TEACHER AND STUDENT BEHAVIOR HAVING TO DO WITH FACILITATING INQUIRY TO BEHAVIOR OF INDIVIDUALS WITHIN THE WORKSHOP LEARNING GROUPS.

One theme of the workshop is to gain skill in helping one another learn. So right now, each person will assess his own helping skills and share his assessment with his trio members. In this manner, individuals and the trio will be appraised on the degree to which individuals see themselves as skilled in helping others learn as well as those skills which are lacking and need further work.

In the exercise each participant will:

1. Use a rating scale to rate his own work in the trios
2. Share his own rating with trio members

b) HANDOUT 11.1 is the rating sheet each of you will use. Take 3 minutes to review it. (Time 3 minutes)

c) Using the definitions of specific behavior for each of the scales given at the top of the sheet, rate yourself on the five scales at the bottom of the sheet. (Time 4 minutes)

d) To share individual ratings, one trio member should volunteer to start and read his ratings on each of the five scales. He should identify any certainties, uncertainties or unawareness that he feels in order to make his ratings clear. On the other hand, it is up to the other members of the trio to make certain they understand the ratings being given. Listeners should review HANDOUT 11.2 and use these skills to make sure they understand the ratings being given.

Take a minute to review Handout 11.2. We have practiced using these behaviors before. (Time 1 minute)

RATIONALE	MINUTES	SCHEDULE
e)	1	e) Ask trios to get together.
f)	15	f) Start trios.
g)	2	g) Stop trios and give directions for next activity.

LEADER INPUT

e) After you get together in your trios, one member should volunteer to give his rating first. After the first member gives his rating and the listeners are sure they understand, the second member of the trio will give his rating. This same procedure will also be repeated for the third member. You will have 15 minutes for all members to share ratings.

f) Will a member of the trio begin by sharing his ratings. Time yourself so that you all get a chance to share and respond to each other's ratings within 15 minutes. [Interrupt after 8 minutes, making sure everyone gets a chance to share his ratings.] (Time 15 minutes)

g) You all have had an opportunity to report your ratings in your trios. THIS HAS PROVIDED DATA TO THE TRIO ABOUT THE KIND OF SKILLS AVAILABLE OR LACKING THAT HELP ONE ANOTHER LEARN.

BEFORE OUR NEXT MEETING, read HANDOUT 12.2. This paper will give you additional moves which extend your ability to facilitate classroom inquiry.

Also, AFTER THE NEXT SUBSET, YOU WILL NEED YOUR SECOND PROBLEM FOCUS. Continue to work to get a problem focus that meets the criteria. This is very important.

INDIVIDUAL TRIO MEMBER RATING

Handout 11.1

Below are explicit definitions of five behaviors. Base your trio and small group ratings on those specific behaviors listed to describe each topic.

1. Listening Skills: Works at understanding what others are saying; asks others to repeat; asks others to clarify. Tells others what he has heard; seems to have understood correctly what others have said.

2. Speaking Skills: Says things clearly, using words others can understand. Speaks in a way that is direct and to the point. Asks what others have heard and offers to clarify. Others seem to understand correctly what he has said.

3. Maintains Group Task: Helps keep the group on the assigned task; mentions when someone is getting away from the task; stays with the task himself; asks for clarification of the task.

4. Diagnoses Group Process: Says when he feels group is bogged down; suggests new procedures for continuing with a task; identifies a procedure that is interfering with a task; raises questions about a procedure being used.

5. Acts to Maximize Group Teamwork: Says when he thinks someone is being left out; says when he feels he is being helped; tries to give accurate feedback from guide sheets; accepts feedback from guide sheet.

Rate yourself on each of the following five scales:

1. Listening Skills (Low) |----|----|----|----| (High)

2. Speaking Skills (Low) |----|----|----|----| (High)

3. Maintaining Trio Task (Low) |----|----|----|----| (High)

4. Diagnosing Trio Process (Low) |----|----|----|----| (High)

5. Acting to Maximize Trio Teamwork (Low) |----|----|----|----| (High)

When you have finished, volunteer to share your individual ratings with the others in your trio. Listeners, make sure you understand the ratings being given. A review of the material on HANDOUT 11.2 may help.

Trio members who are listening to another member's self-rating can increase the possibility for understanding by using the skills listed below.

1. Restate what he has heard	
2. Ask if he has repeated accurately	
3. Ask the speaker to repeat something he has said in his statement	
4. Ask the speaker to give an illustration of something said in his statement	
5. Ask the speaker to define a word he has used in his statement	

SUBSET 12 144 Minutes
FACILITATING GROWTH MOVES

NOTES TO LEADERS

Some participants may be bothered by the words used to describe the Facilitating Growth Moves. This language will be changed in future revisions. For the present, however, emphasis should be placed on the newly defined intentions of the teacher rather than the language used to describe them.

Where participants disagree with Answer Sheets 12.4 and 12.6, ask them to work together to understand what the handout is saying. In this subset, they are really wrestling with the question, "How do I know if I'm responding correctly?" They must depend on the answer sheet for help with this question.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 12

2. Tape recorder ready with TAPE C-III

3. Preparation completed for demonstration of knife problem (Knife, Candle, Cloth, Clear Water Container)

4. PARTICIPANT MATERIALS

    12.1 The Knife
    12.2 Autonomy: Who Decides?
    12.3 Diagnosing for Use of Facilitating Growth Moves
    12.4 Verification, Experimentation, Analogy, Necessity, Synthesis
    12.5 Classroom Interaction

SUBSET 12

RATIONALE	MINUTES	SCHEDULE
a) Participants get frustrated and intuitively sense that the allowing inquiry moves are not enough. Students, for the most part, begin to get frustrated because they don't know what to do with their ideas now the teacher doesn't judge them. It is, therefore, timely to introduce the next set of moves which the teacher can use. These help students become aware of what they can do to proceed on their own to build and test their ideas.	3	a) Introduce Subset 12. Show SCHEDULE OF ACTIVITIES.
b) Participants must conceptualize the problem focus used in the recorded activity if they are to attend to teacher behavior.	7	b) Describe TAPE C-III and demonstrate Knife problem. (HANDOUT 12.1)
c) Participants can better understand the concepts if they can hear a recorded real-life situation.	11	c) Give directions for listening; play Tape C-III.

LEADER INPUT

a) When someone says "Facilitating inquiry is nothing new," or when the remark is made, "This isn't any different from what we've always done," he generally means the allowing inquiry moves are nothing new. This is the case. However, using the allowing inquiry moves is not all that's involved in facilitating inquiry. In fact, it is only the beginning. Although students value the chance to intuitively explore ideas, often they lack the awareness and the process necessary for productively building and testing their own ideas. They are, in effect, sometimes unable to proceed on their own. The necessary element to facilitating inquiry is the ability of the teacher to have students become aware of the process in such a way that the right of the student to choose how to proceed is always maximized. This is what we mean when we talk about facilitating autonomous student growth.

In this exercise, you will:

1. Hear a tape where the teacher is attempting to facilitate autonomous student growth
2. Practice diagnosing inquirer growth
3. Practice using the facilitating growth moves

b) I will play a tape recording where the teacher is facilitating the autonomous growth of students. The teacher and the students are the same as you heard on Tape C-II. This is the third problem focus that the students have worked on. The original one-hour tape was cut at three or four places to obtain a ten-minute tape that would be representative of the entire activity. First, let me show you the problem the teacher gave to the students. DEMONSTRATE KNIFE PROBLEM.

So that you know something about the problem as you listen to the tape, take about 4 minutes to read the problem summary, HANDOUT 12.1. (Time 4 minutes)

c) As you listen to the students and teacher interacting on the tape, see if you can detect the tactical moves the teacher uses to help students become aware of processes for building and testing ideas. Try to determine when they begin to use the processes independent of the teacher. (Time 11 minutes)

SUBSET 12

	RATIONALE	MINUTES		SCHEDULE
d)	Participant's conceptions and perceptions will change as a result of formal conceptual information. Some of his conceptions will be reinforced and made clearer. He will be aware of his informal knowledge and his formal knowledge will expand.	11	d)	Refer to HANDOUT 12.2 and give directions for reading.
e)	Participant's understanding of the conceptual input will be facilitated by his application of the new concepts to some actual inquirer behavior. The answer sheets will provide participants with a rationale for using facilitating growth moves in light of student behavior. Participant's understanding of student autonomy will increase as he selects tactical moves in relation to diagnosed student needs.	44	e)	Give directions for practicing facilitating growth moves and refer participants to HANDOUT 12.3.
f)		48	f)	Give input on trio practice and refer participants to HANDOUT 12.4.

LEADER INPUT

d) In the HANDOUT 12.2 which you read, you found (1) a description of student autonomy, (2) a description of sequential moves the teacher uses to maximize student autonomy and (3) descriptions of teacher intentions and actions for each of the facilitating growth moves. By yourself, review the paper, paying particular attention to the intent of each of the moves. When you finish, try to be able to name the moves yourself. (Time 11 minutes)

e) Now you have an additional set of moves which increase the alternate ways for responding to students. The new moves, like the others, have a specific intent, a reason for their use. There is a strong belief that the teacher who has a greater range of alternate ways of responding to students and who uses them according to their intent, is potentially more effective than one with only a limited number of responses. So that you can begin to expand your range of alternative moves, look at HANDOUT 12.3. You SHOULD work on it alone. You will be diagnosing inquirer growth and deciding which of the allowing inquiry moves are appropriate. Directions for completing the exercise are attached to the worksheet. If you disagree with the answer sheet, talk about it with a member of your trio. Try to understand what the answer sheet is saying. (Time 44 minutes)

f) To further practice using some of the facilitating autonomous growth moves and to demonstrate how these moves provide alternate responses to students, we will use some of the same student responses which were used in learning inquirer behavior.

Each trio will use ONE copy of HANDOUT 12.4. It contains fifteen verification, experimentation, analogy, necessity and synthesis responses that you will recognize from the past workshop activity dealing with inquirer actions. These actions are followed by an answer sheet giving teacher responses from both the facilitating growth and allowing inquiry moves. The inquirer responses, as well as the answer sheet dealing with the teacher tactical moves, are divided into three sets. As was the case in the activity where you identified inquirer actions, there are three roles within the trio: teacher, student, answer man. The tasks shift for each set. One member of the trio should volunteer as student for the

RATIONALE	MINUTES	SCHEDULE
f) The answer sheet will indirectly provide participants with a rationale for using facilitating growth moves in response to inquirer actions.		f) Continued
g) Participant's expanding skill in facilitating inquiry will be reflected in the difference between his earlier responses to these statements and his present responses.	20	g) Give directions for completing HANDOUT 12.5 and comparing with first responses.

LEADER INPUT

f) first set. The person on his right will be the teacher and the other member the answer man. The student should have the first page of Handout 12.4. The other pages, dealing with the teacher responses, should be used by the answer man. To begin, the student will read the first inquirer response for Set I. The teacher will respond with either an allowing inquiry or a facilitating growth move, whichever he feels is most appropriate. THE TEACHER SHOULD ALSO INDICATE WHY HE RESPONDED THE WAY HE DID. THE ANSWER MAN WILL FOLLOW BY READING ALL THE POSSIBLE RESPONSES FROM THE ANSWER SHEET. The student will then read the second item to the teacher with the answer man following the teacher response and so on to the end of Set I. Rotate tasks at the end of Set I and go on to Set II, rotating the sheets to the proper persons. IT IS IMPORTANT THAT THE TEACHER NOT ONLY RESPOND BUT TELL WHY HE RESPONDED THE WAY HE DID. IT IS EQUALLY IMPORTANT FOR THE ANSWER MAN TO READ ALL THE POSSIBLE RESPONSES FROM THE ANSWER SHEET. If there is disagreement with the answer sheet, try to help one another understand what the answer sheet is saying. Don't look ahead on the answer sheet. This will spoil the opportunity for the teacher to respond on his own.

Get into your trios and begin with Set I. (Time 48 minutes)

g) Take a look at HANDOUT 12.5. This is the sheet which you used earlier in the workshop. Use it again to respond to the inquirer actions, completing items A, B, and C. Compare your responses with those given in Subset 3. Have you used alternate responses? Have you been able to identify the intent of your responses? (Time 20 minutes)

I. MEANS BY WHICH FOCUS IS CREATED

A. Equipment

Knife, candle, cloth, cylinder of water at room temperature

B. Demonstration

The teacher should hold the blade of a knife over the flame of a candle. After a few moments, the blade will bend downward. He then should dip the blade into the cylinder of liquid; it will straighten. Next, wipe the liquid from the blade, turn it over, and hold it in the flame again. This time the tip of the blade will curve upward. Again, the blade should be immersed in the tank and again it will straighten.

C. Questions

1. Why does the knife bend down the first time it is heated and up the second time?

2. Why does the knife straighten when placed in the cylinder of liquid?

II. PROBLEM ANALYSIS

A. Consequential Variables

1. The knife must be constructed of two different kinds of metals, each metal having a different rate of expansion.

2. Strips of the two different metals which form the blade must be adhered to one another all along the blade.

B. Attendant Data

1. The two strips of metal used in constructing the blade are copper and tin. They are soldered together.

2. The liquid in the cylinder is water at room temperature, approximately 70 degrees F.

3. The candle flame reaches a temperature of about 2,000 F.

4. When moved across the flame, the knife blade reaches a temperature of around 300 degrees F.

B. Attendant Data (Continued)

5. When a solid is heated, it expands. The coefficient of linear expansion of copper is 0.000017, and the coefficient of pure tin is 0.000027.

6. When the knife blade is heated, the tin side expands more.

7. The blade does not melt.

8. The blade always bends toward the tin.

9. The water cools the blade quickly. If left in the air, the bent blade would straighten but more slowly than if placed in water.

C. Scientific Principles

1. Transmission of Heat

2. Volume Change in Solids and Liquids

AUTONOMY: WHO DECIDES?[1]

Handout 12.2

Autonomy: An Operational Definition

To learn how to ride a bicycle, sooner or later a child must try to ride it. No matter how much we try to help by talking to him about balance, by holding the bicycle and running alongside as he makes his first attempts, the time must come when the learner and bicycle are alone; when the learner assumes autonomy. And we must recognize that the longer we prevent this critical confrontation in order to protect the child from a probable fall, the longer we also prevent the child's moment of success from occurring, and the longer we keep him from experiencing that feeling of being successful on his own.

To learn how to throw a ball, the moment must come when the child picks up the ball and throws it himself.

This notion of individual task confrontation holds true beyond the development of physical skills. One of the central purposes of education is to maximize the development of children's rational intellectual powers. These abilities, like physical skill, grow through exercise. Students become increasingly capable as they create or identify ideas or plans in response to a confrontation with their environment and as they rationally explore alternatives in search of the best, most useful, most productive, or most powerful response. In so doing they deal with the following kinds of questions:

> How can I find out which of my theories, plans, or ideas are most useful?
>
> What data do I need to find out?
>
> When I decide to experiment in some way to gather data, what experiment should I do?
>
> What equipment, materials, or apparatus are appropriate?
>
> For what variables should the experiment be controlled?
>
> When should I repeat the experiment and when should it be redesigned?
>
> How will I know if the experiment has been adequately performed?
>
> How will I know when I'm through experimenting?
>
> Should the data be recorded?
>
> In what ways should the data be organized?

---

[1] Strasser, Ben B. "Autonomy: Who Decides?" Modern Trends in Education, by Costa, Lavaroni, Newton and Strasser. © 1967, Science Research Associates, Inc. Reproduced by permission of the publisher.

How much data will I need?

Among the data available to me, which are good and which are irrelevant or useless?

What does the data mean in terms of my theory?

In what ways may I identify the limitations of the data, ideas, theories, or plans with which I'm working?

When and on what bases should I keep a theory, idea, or plan as it is, and when should it be modified or discarded?

When, how, and in what situations, outside of the present one, are my data, theories, ideas, or plans applicable, and how can I determine this?

How will I know if a particular search in which I am engaged is on the wrong track?

How do I decide when my search has been completed for the moment, either because the initial question has been answered and the problem is no longer a problem, or because the topic has been explored as far as my capabilities at the time permit?

In the usual sense, autonomy is a synonym for self-initiated, self-directed, self-evaluated activity of some kind. Within the specific context of this discussion, autonomy means initiating action, following through, and deciding independently, how well you've done through your own efforts.

Autonomy doesn't mean the individual has to invent all of his own theories or ideas, nor does it mean that he must gather all of his own raw data. The difference here is that he may explore theories of others, but he decides when to seek those theories, and he decides if and when they are useful and meaningful to him. Autonomy does not mean that each student has to rediscover the wheel--it just means that for the wheel to have any real meaning for the student, he must be cognitively, as well as physically, active in the process of building that meaning. He must be able to program his own learning.

If the student is to learn, he must learn how to decide for himself. He must make decisions about his information, draw his own inferences and match them with the inferences of others, and evaluate and control his output as well. When we stop and look at the realities of the classroom, however, we usually find quite a different picture. The important decisions are usually made by teacher or administrator. In some cases teachers share the responsibility with the curriculum guide, authors, and producers of various educational materials. Curriculum guides decide about theories, textbook authors decide about data, and teachers decide whether or not the students are on the right track. In few situations does the concern arise as to the bases for these decisions.

By learning to learn, we feel that students learn how to learn. They learn how to build meaning by building meaning, and to build meaning means to decide for yourself. For example, consider a series of operations useful in testing a given theory to building meaning in relation to a theoretical proposition. The inquirer must:

1. Decide if he can test the theory or idea
2. Decide what data he needs to test his theory
3. Decide if he can generate the data he needs
4. Decide what operation will be useful in generating the data necessary
5. Design and carry out the data-generating operation
6. Decide what the data gathered means in relation to the theory he is testing
7. Decide whether to keep the theory as it is, rethink it, modify it, or disregard it in the light of the data gathered.

Facilitating Growth Responses

If a student were to state a theory and then proceed to move through some data-generating operations to the drawing of inferences in relation to the theory, we could assume he is capable of functioning at a relatively high level of autonomy--at least in that situation. Usually, however, children are not ready or able to function at such high levels during their first efforts. The process of moving from idea to substantiation is a complex one. Therefore, when a child has an idea it is probably of little help for the teacher to respond with, "It's up to you to decide," and walk away. In such cases the teacher may use a variety of responses designed to facilitate the learner's growth toward becoming more autonomous, rather than preventing or distorting it. In this way the teacher is using tactics that support the processes of the inquirer.

Facilitating growth responses are questions or statements by the teacher that help those students who are not ready to assume maximal autonomy to move through a strategy. Following are illustrations of facilitating growth responses...note the effect of these teacher responses on the total sequence of learner operations. Who decides?

Autonomy: Who Decides?

Handout 12.2

Inquirer Decision	Teacher Facilitating Growth Response
A. Decide if he can test the theory of idea.	1. "You have a theory. Now what will you do?" (Teacher decides the student has a theory and implies that he can test it.)
B. Decide what data he needs to test his theory.	2. "What do you need to know to test your theory?" (Teacher decides it is important to think about data next and directs the learner's attention to data as a base from which the data-generating operation is derived.)
C. Decide if he can use an operation to generate the data he needs. D. Decide what operation will be useful in generating the data necessary.	3. "What will you do to get the data you need?" (Teacher decides the learner can use an operation and directs the learner's attention to the consideration of operations next. The question also implies that the data may be generated through an operation.)
	4. "You can experiment to find out." (Teacher decides experimenting [or another operation] is the best way for the student to generate the data necessary.)
E. Design and carry out the data-generating operation.	5. "You can experiment by changing the water..." (Teacher designs an experiment for the learner that will produce the data necessary. In so doing, the teacher decides what experiment is to be done, the materials to be used, how the experiment is to be done, and when it is done successfully.)
F. Decide the meaning of the data he has in relation to the theory he is testing.	
G. Decide whether to keep the theory as it is, rethink it, modify it, or discard it in the light of data gathered.	

Autonomy: Who Decides? Handout 12.2

If a learner were to carry out this kind of theory-testing strategy only in response to all of the teacher facilitating-growth responses, i.e., Nos. 1-5, the child would be functioning at a low level of autonomy. His teacher would have decided for him. Note, however, that even at this lowest level, the child still has full autonomy in relation to drawing inferences from the data as he seeks a data-theory match (F), and whether or not he will keep his theory as it is, rethink it, modify it, or discard it and search for another (G). There is freedom in action, and the school is one place where a child should be able to function within an environment of psychological support and freedom; a place where a "wrong" decision means that the student has learned something he might not have learned otherwise--not that he's a failure.

While helping his students become more autonomous, the role of the teacher is similar to that of the parent teaching his child to ride a bicycle. Certainly, the first time the child is probably not ready to ride gloriously off into the sunset. Dad starts out by holding the bicycle seat tightly. Gradually, he lets loose of the seat for longer and longer distances.

In teaching, our role is much the same. We seek a balance between full autonomy and a degree of autonomy that the learner can productively utilize. Next time we allow opportunities for him to be more autonomous than he was the previous time. For example, if a teacher finds himself using the whole sequence of facilitating-growth responses, he might stop using response No. 5 to see if the learner is able to carry out that operation for himself. Next time he would stop using No. 4, and so on. The technique here is that regardless of which operations he does and which the learner does, the teacher works toward the learner's independence and gradual assumption of the task of deciding for himself. If we find ourselves helping or guiding as much a few weeks from now as we did today, we can only assume the learner has not learned (or that perhaps our teaching stragegy needs to be reexamined).

The way some modern math materials help young children to learn to write numerals provides a specific illustration of this notion. On first encounter, the numeral is printed in dark black type, with a star at the point at which the child should begin to write that numeral. Starting at the star, the child traces the numeral.

At the next level, the numeral is only partially outlined with some dash marks. The star is still in place. This time the child begins at the star and follows along the dash lines provided and completes the numeral.

Next, only a star is provided for the starting point. The child begins at that point and completes the numeral. And finally, the child is expected to complete the numeral entirely on his own. No helps are given. The child is autonomous in this sense.

With respect to learning and autonomy, learning means that the student is able to function independently at a higher level than he was able to some time ago. This will only happen if his teacher wants it to happen and allows it to happen.

In working with our students over a period of time, we may stimulate growth by using different response levels in different situations. For example, with a specific situation we may stop our support at level No. 2, never helping him below that level on that particular problem. When engaged in another problem situation, however, we may move down to level No. 5. Thus, in one case we provide an opportunity for the child to wrestle with a problem for himself, while in other cases we may give him much more help.

We must always remember, though, that any facilitating growth response we use denies the child the opportunity to carry out that operation because the teacher does it for him. It's done for that problem situation. If the teacher does it, Billy doesn't get the chance. And if Billy doesn't get the chance to decide for himself, how will he learn to decide?

As the teacher gradually reduces the use of the facilitating growth response, he is creating a situation in which he can gather data about his students. Is Billy able to decide what operation is appropriate to the specific task at hand? We can find out by letting Billy decide. (It is interesting to note that evaluation of autonomy takes place within the context of the learning process--not apart from it. Standard techniques of evaluation, i.e., written tests, are of little help in assessing a child's functional level of autonomy with respect to a given task.)

There is another issue in relation to who decides. It may be easily overlooked but, nonetheless, is critical in the process of building meaning--not the question of sequencing. Who decides what is to be done next? I recall a visit to a sixth grade classroom. Just as we were walking in the door the teacher was talking to the class. "But you can't theorize yet. You need more data first!"

We theorize when we're ready, not when others say we should. Whether to theorize or to generate data is a decision that should be made by the individual. When he suddenly gets a flash of insight, why shouldn't he theorize at that moment? To theorize doesn't mean you're through; it means you're on first base! The decision as to what should be done next is one of the manifestations of autonomy. It too must be faced by the student.

When we consider the tenet of autonomy as stated earlier, "The child decides whether or not his theory is a useful one," the question (and honest concern) as to correctness of what is learned arises. What if the child's theory is obviously incorrect? Shouldn't we correct it? There are two ways to deal with this dilemma which are consistent with this assertion.

Before considering how we might deal with this situation in the classroom, it is perhaps useful to reflect on the notion of "correct" in relation to children's theories. The only external responsibilities imposed on the student through the structure of the situation are that the products of his cognition are not in conflict with an essential reality. The criteria for correctness include internal, logical consistency rather than individual decision and action. An incorrect theory means that the data-theory match is either very weak or that there is no match.

One way a teacher might deal with such a situation is to provide data that might stimulate the child to rethink his theory. For example, if a child is convinced that a given piece of wood sinks because it is small, the teacher might suggest the child generate more data as follows: (1) Give the child several pieces of wood the same size as the wood that sank and say, "Here, try these. See if your theory is a useful one." (2) Ask, "What might you do to test your idea further?" Or, the teacher may take a more directive role such as, (3) "Here's a piece of wood. It's the same size as the piece you have that sinks. According to your idea, what do you think will happen when we put this small piece of wood into the water. Will it float or will it sink?" By making data available to the child the teacher attempts to reactivate the child's inquiry into the situation in the hope that any data generated will result in some positive adjustment of the child's theory or idea. Regardless of whether he corrects the idea or not, the child will have more data.

A child's inquiry into a problem situation usually deals with specific events. Our concern for correctness is usually within the realm of concepts or generalizations. It is possible, therefore, to deal with the concept in many ways other than giving the child an answer to a specific problem situation. Perhaps we could talk about and play with the idea that trees and toothpicks float. Or the class could watch a film, do reading or watch instructional TV that is related to the idea under consideration. But we will not discuss the relationship between the idea and the specific problem of yesterday. The teacher will watch to see if Billy relates the idea the class worked with to his previous problem situation.

In other words, when we discover a misconception, rather than try to correct it at the moment, we should plan for systematic ways of dealing with it. The children will be back tomorrow. There's time, and if it is important enough to correct, it is important to plan for that correction. In dealing with the misconception, it is significant to underscore that we do not give "the answer" to the specific problem situation. The child must make the match.

The concept of autonomy raises a question about who has autonomy in the classroom. The real question, however, is not who has autonomy, but rather who uses autonomy, when, at what time, and why.

Autonomy: Who Decides?

Handout 12.2

Autonomy in Teacher Behavior

In allowing autonomy in the students, the teacher has not given up his autonomy. He merely moves to a more complex level of decision making. The teacher is in control of the classroom, and decides when, how much, and in what situations he will allow student autonomy. For example, NOT ALL situations are vehicles through which children should develop their autonomy. We don't want children to be autonomous with regard to safety practices, nor do we let them assume autonomy for their own well-being.

Allowing autonomy demands techniques by which the teacher can assess the level at which a child can function. It also requires a repertoire of precise teaching techniques (such as the facilitating growth responses identified) which he knows and is able to use successfully at the moment, relative to the situation at hand.

The teacher also needs techniques that increase the learners' awareness of operations performed and of their functions. The learner who is aware of the operations open to him is on the road to becoming more productively autonomous than his counterpart who uses intuition in every new problem.

Using intuition on a problem indicates the learner has not yet developed a repertoire of operations; he is not conscious of the processes available to him. The learner matches his wits with each new problem situation. This is the *intuitive level.* He really doesn't know what he is going to do before he does it, nor can he define what he did afterwards. The next time he faces a problem, he'll probably work in the same way. This level, nonetheless, is significant in the growth cycle. The learner ultimately finds there *are* operations he can use to deal with encounters.

The next level of operation (an outgrowth of the intuitive level) is the *awareness level.* At this point, the learner is aware of a range of operations he is able to carry out. These are more or less discrete operations for him. (Intuitive operations continue to expand his repertoire as he acts and reflects on his actions.) In dealing with a confrontation, the learner uses specific operations and can identify them. For example, he knows what "to experiment" means, he can carry out an experiment, and he knows when he has experimented.

The awareness level is the threshold for the *functional level.* At this level the student not only knows the operations open to him and how to carry them out, but he also knows the variety of functions each of the operations may serve. He understands and implements the *why* behind the operations he uses or plans to use. He identifies a plan of action he feels will be useful in dealing with a confrontation and carries out that plan. He knows what certain operations will do for him.

But learners do not necessarily move from the intuitive level, to the awareness level, to the functional level without teacher behavior designed to facilitate this growth. And that teacher behavior must be consistent with the concept of autonomy if the students are to become more productive and effective in dealing with their encounters.

Thus, teacher behavior should be at the functional level for the teacher. He should know the range of teacher tactical moves useful to him as discrete operations, and should know the functions that each tactical move serves.

Obviously the teacher who uses intuition to get him from one day to the next will be less effective, in the long run, than his counterpart who operates on the functional level with respect to his teaching techniques.

As mentioned earlier, the learning in this workshop is concerned with classroom verbal interaction which allows and facilitates autonomous student inquirer behaviors. The question then arises, "What is it specifically that the teacher does through his own verbal behavior to facilitate the student's growth toward more autonomous action?"

The following pages are in answer to this question. You will be learning to identify a second set of tactical moves, used to help the student become more aware of his inquiry behavior and, therefore, better able to proceed on his own.

TEACHER TACTICAL MOVES
FACILITATING AUTONOMOUS STUDENT GROWTH

Handout 12.2

Suchman identified the general conditions essential to inquiry and the growth of inquirers. Strasser,* building on Suchman's work, identified 22 categories of teacher verbal interaction, called TACTICAL MOVES, which the teacher uses to facilitate inquiry. Here, the 22 tactical moves have been reduced to 18 and reorganized to simplify learning and practice.

ALLOWING INQUIRY TO HAPPEN

1. Focus Setting
2. Structuring
3. Clarifying
4. Accepting
5. Giving Data Requested
6. Teacher Silence

FACILITATING AUTONOMOUS STUDENT GROWTH

7. Identifying Inquiry Operations, Subject of Operations
8. Identifying Inquiry Products: Data and Theories
9. Probe for Specificity
10. Teacher Probe for Data
11. Teacher Probe for Operation
12. Operation Clue Giving
13. Instructing

When learning and practicing these moves, you are primarily concerned with having students grow in their own use of the process. Notice the teacher's main intent is to have the student become aware of the processes he is using.

TUNING IN TO STUDENT FEELINGS, ATTITUDES, PERCEPTIONS

14. Probe for Theory, Status of a Theory, Inference
15. Probe for Intent of Operations, Intent of Subject of Operation
16. Probe for Prediction, Explanation
17. Giving Data, Theories
18. Data Clue Giving

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*Strasser, Ben B. Components of a Teaching Strategy: Tactical Moves in Inquiry, Unit I. San Anselmo, California: Search Models Unlimited, 1967, pages 9-21.

Teacher Tactical Moves
Facilitating Autonomous Student Growth

Handout 12.2

Here, the concern is with learning and practicing the moves concerned with FACILITATING AUTONOMOUS STUDENT GROWTH. On the following pages each move is described four ways, Teacher INTENT, Teacher ACTION, Student ACTION and Student EFFECT. As you examine the moves and prepare to practice them, consider the four descriptions in the following manner.

Teacher INTENT: An unobservable purpose you want to fulfill

Teacher ACTION: Something observable you do to fulfill your intent

Student ACTION: Something observable you expect the student to do in response to your action

Student EFFECT: Some unobservable inner state of the student that you hope to be the result of your action

On each of the following pages, begin by reading the intent of the move in the left column. In some cases, a move will have more than one intent. Then become familiar with the teacher actions that are consistent with the identified intent. The teacher actions are those things the teacher says or does that are intended to bring about a desired response from students. The actions identified in the second column from the left are those which have been found particularly useful to fulfill the stated intent. Refer then to the third and fourth columns which identify the anticipated and desired student responses. In this exercise it is important that you recognize the intent of each move and the actions which you can take to fulfill each intent.

IDENTIFY INQUIRY OPERATIONS, SUBJECT OF OPERATION

Handout 12.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Have student become aware of how he is using process; Allow him to decide if what he is doing is useful and important to him	1) Says, You've just done an experiment." 2) Says, "Experimenting is one way of testing an idea, isn't it?" 3) Says, "You just verified what you thought took place." 4) Says, "You've verified a property of water." 5) Says, "You first found out if the liquid was water, then you found out the boiling temperature of the liquid." 6) Says, "You've just found out the temperature or condition of the liquid." 7) Provides data in response to a student's data probe, then says, "You just verified an event. The liquid did move from left to right." 8) Says, "That was an experiment. An experiment is when you change the original event to see what would happen under new conditions." 9) Says, "You just verified the condition of the liquid. A condition is the temporary state of an object."	1) Replies, "Yes, I know." 2) Gives the name of the operation while performing it. 3) Indicates he doesn't want to know what an object is called but wants to know how the object behaves	1) Feels power in knowing how to get at data

IDENTIFY INQUIRY PRODUCTS, DATA AND THEORIES

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Have student become aware of the products resulting from his use of operations Allow him maximum autonomy to decide if such products are useful to him	1) Says, "You've got a theory, a way of explaining the event." 2) Says, "You just generated some new data." 3) Says, "You've just come up with a new way of explaining the problem." 4) Says, "Experimenting gives you data," after a student experiments	1) Replies, "Yes, I know." 2) Says, "I need some information." Then uses a data generating operation 3) After using a data generating operation and receiving data, he says, "I've got a theory now."	1) Feels power in his ability to generate data and ideas

PROBE FOR SPECIFICITY

Handout 12.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Have a student design a more precise operation and influence his action slightly by not responding to the data probe in its present form	1) Says, when student seeks to generate data about the condition of an object but does not include a time referent, "At what time during the event are you talking about?" 2) Replies, "What kind of liquid would you want to use?" after student asks, "Would the pulse glass work the same way if I used a different liquid?"	1) States a specific time or object that he has in mind	1) Values his own ability to perform an operation controlling all necessary variables 2) Increasingly aware of variables which can be controlled

TEACHER PROBE FOR DATA

Handout 12.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Discover if a student is aware of the specific data he needs to build a theory or test a theory (when he hasn't taken the action to get the data on his own) Exert some control over his actions by clueing him to this need	1) Says, "What data do you need to develop a theory?" 2) Says, "What data do you need to decide if your theory accurately explains the event?" 3) Says, "What data do you need to decide if your idea is a useful one?"	1) Shares data that he needs 2) Says he doesn't know what data he needs 3) Says nothing 4) Immediately performs a data generating operation 5) Shares theory at subsequent time and then performs data generating operation to test 6) Says he has already tested his theory and explains how he did	1) Aware of data as the basis for both building and testing ideas 2) Feels power in his ability to analyze and select data relevant to his idea
Intention II: Discover what data a student has generated, or is generating	1) Says, "What data did you gather when you held the pulse glass?" 2) Says, "What were you looking for when you used the book?" 3) Says, "I'm not sure what information you're after."	1) Shares data he has generated 2) Shares data he is looking for 3) Indicates he doesn't know what he is after	1) Trusts teacher and appreciates being allowed to "mess around" 2) Stimulated and excited when "messing around"

TEACHER PROBE FOR OPERATIONS

Handout 12.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated observable response to teacher's action	Anticipated inner state of student in response of teacher's action
Intention I: Find out if student is aware of what operation he could use to get specific data to build or test a theory (when he hasn't taken action to use an operation) Exert some control over his actions by clueing him to this need	1) Says, after a student shares a theory for which there has been no test, "How could you test that idea?" 2) Says, after a student asks teacher to confirm a cause, "What might you do to decide for youself?" 3) Says, after a student indicates he thinks something might be the case, "What could you do to find out for sure?"	1) Responds with an operation to find out for himself, test an idea or confirm his suspicions on his own 2) Says he doesn't know what he would do 3) Shares his theory at a subsequent time; then performs data generating operation to test 4) Shows by subsequent behavior that he doesn't ask teacher to confirm a cause for him 5) Says, "I'm thinking that so-and-so is the case," and then performs data generating operation to confirm it	1) Feels confident in his ability to get the data he needs 2) Values certain operations for what they can do 3) Sees teacher's probe as helpful

OPERATION CLUE GIVING

Handout 12.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student as result of teacher's action
Intention I: Influence the action of the student to an even greater degree by naming an operation the student might use to get the data he needs, knowing the student doesn't know how on his own.	1) Says, "You could experiment to test that idea." 2) Says, when student indicates that something might make a difference, "You could experiment to see if it really does make a difference." 3) Says, "You could check to see if that really took place." 4) Says, "You could verify the existence of the object."	1) Performs the operation suggested by the teacher 2) Subsequently shares a theory; then uses a data generating operation to test it	1) Feels pleased that he can go somewhere with his idea 2) Appreciative of teacher's help

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student as result of teacher's action
Intention I: Influence the action of the student to the highest degree by giving an example of how an operation could be used (including the subject of the operation) to generate the data needed, knowing the student can't do it on his own	1) Says, "You could test that idea by experimenting. You could put a strong light under one end of the pulse glass to see if the liquid would move."	1) Student follows the example and performs the operation	1) Feels pleased that he can go somewhere with his idea
	2) Says, "Let me give you an idea of what you could do. You could...."	2) A student, other than the one the teacher is instructing, gives an example	2) Appreciates teacher's help
	3) Says, "Does anyone have an idea of how you could get this information?" (asking other students)	3) Subsequently uses a data generating operation on his own	3) Feels increasing power in his own ability to generate data

OBSERVABLE STUDENT ACTIONS INDICATING AN AWARENESS OF INQUIRY PROCESS

Handout 12.2

Below is a summary of those student behaviors shown in the student action columns of the preceding pages. They are the responses which a leader can theoretically expect when he uses the facilitating growth moves. They are also the behaviors which define the "Inquiring Student" at the level where he is AWARE of the processes he is using to build and test his own ideas.

1. Asks a series of questions related to one variable within the problem.
2. Tells if he is after data or sharing an idea.
3. Sharpens a subsequent message to fine clarity after having had teacher seek clarity on previous occasions.
4. Finds teacher having to ask, "What do you mean?" less frequently.
5. Says when he thinks he has received bad data from the teacher.
6. Asks to be allowed to get "his own answer."
7. States an idea and then does something to get data to test it.
8. Selects more than one data source.
9. Consults one data source and then turns to another.
10. Makes 4, 5, 6, data probes in rapid order.
11. Follows the statement of a theory with a data probe to test it.
12. Goes to data source spontaneously.
13. Gives the proper name of the operation while performing it.
14. Indicates that he doesn't want to know what an object is called but does want to know how the object works or behaves.
15. Indicates data that he needs.
16. Indicates data he has generated.
17. Shares a cause (theory) and doesn't ask the teacher to confirm it.
18. Shares an inference that "agrees" with data he has generated.
19. Says he wants to withhold judgment for the time.
20. Makes an accurate prediction with his theory.
21. Tells the subject of the operation he is using.

FACILITATING AUTONOMOUS STUDENT GROWTH Handout 12.2

Rationale for Teacher Tactical Moves

The following information has been included to identify the reasons for using the facilitating growth moves.

IDENTIFYING INQUIRY PRODUCTS: DATA AND THEORIES	Students will become aware of the results of their actions if the teacher labels and identifies those results.
IDENTIFYING INQUIRY OPERATIONS, SUBJECTS OF OPERATIONS	Students will become aware of the kind of actions they're taking if the teacher labels and identifies those actions.
PROBE FOR SPECIFICITY	Students will become more precise in their language and actions if the teacher asks for greater specificity when the student shares an ambiguous statement.
TEACHER PROBE FOR DATA	Students will become more aware of how to go about developing their own ideas if the teacher asks them to identify the kind of information they need in order to get started.
TEACHER PROBES FOR OPERATION	Students will become more aware of how to go about developing their own ideas if the teacher asks them to identify what they would do to get the information they need in order to get started.
OPERATION CLUE GIVING	Students will become better able to work independently of the teacher, if, when the student doesn't know what to do to get the information he needs in order to get started, the teacher clues him to what he might do.
INSTRUCTING	Students will become better able to work independently of the teacher if when the student is unable to use the clue provided by the teacher to get the information he needs, the teacher gives a specific example of how he could get the information he needs.

DIAGNOSING FOR USE OF FACILITATING GROWTH MOVES

Handout 12.3

Responses from ten inquirers working on the knife problem focus have been given on the following pages. For each of the responses you also have been given some background information on the inquirer. You, as the teacher, will need to use it to decide how to respond to the inquirer.

Your decisions have been narrowed considerably because only the beginning uses of the facilitating growth moves are being studied. Nevertheless, you will have to give some thought to the inquirer's background and his immediate response in order to decide which facilitating growth move is appropriate. In the case of a generating data action on the part of the inquirer, you will naturally respond first with data (from the allowing inquiry moves). Then, you will have to decide on the proper facilitating growth move.

Each of these inquirers has been involved in three problem focuses for a total of about three hours: the Pulse Glass, an apparatus called the Ball and Ring, and the Knife.

Read each of the items and write in your response in the space provided. Answer Sheet 12.3 will identify appropriate responses to the individual items as well as provide a rationale. Use the answer sheet as you go along or make your own responses first, then check with it. The main objective is to end up with a better idea of how you would tailor your responses to individual students.

1. Sam: "The heat is what makes it go. The knife is responding to the heat and bending."

Sam has volunteered three theories in response to three separate problem focuses. Although he has indicated an awareness of data generating operations, he has never used a data generating operation to test a theory. Up to this time you have responded to his theories by using an accepting move, ("OK, I understand.") watching for him to begin testing his ideas on his own. During his past fifteen responses he has not done so.

How might you respond to him?

T:

2. In reference to the above situation, suppose you used a probe for data move. ("What would you need to know to feel that your idea really explains the behavior of the blade?") Sam said, "Pass." Some time later Sam raised his hand and when called on says:

> "I still think my idea about heat is right. Heat must make it bend."

Now, how do you respond?

T:

3. You sense that Jack is feeling quite frustrated because you haven't judged any of the four theories he has shared. In the past when he shared a theory and then asked, "Is that right?" you responded with a structuring move. ("It's up to you to decide.")

   Jack: "I think the blade bends because of heat. I want to know if that is why it moves. Is that why?"

How do you respond?

T:

4. Paul: "Would it work in the same way if you were to put one end in water?"

Paul has performed eight experiment operations when working on the different problems. However, many times it has been difficult for you to provide data because you have difficulty picturing just how the experiment is being done. At times you have responded, "It might," or "It could," because details of the experiment seem to be missing.

How do you respond to his question?

T:

5. As far as you can tell, the students, including Mary, are not aware that operations have subjects and that by selecting certain subjects for operations they could get certain kinds of data. The students have used different subjects randomly without apparently being aware of their function. They know the name of the metals in the knife blade, but have acknowledged that knowing the name isn't much help.

   Mary: "What is the expansion rate of brass?"

How do you respond?

T:

6. Bob has shared an idea having to do with the magnetic field making the knife bend. You have decided it was appropriate to respond to his idea with a probe for data move. You asked, "What would you need to know to feel fairly certain that is why it bends?"

   Bob replied, "I would need to know if a magnetic field is pulling it."

At the time, you simply accept his response. Now, some time has gone by and Bob has done nothing to get the information.

Bob raises his hand and says, "I don't know what to do to find out if a magnetic field is pulling the knife."

How do you respond?

T:

7. Jane has shared an idea about the bending knife. Because you thought the time to be right, you use a probe for data move. ("What would you need to know to feel that your idea is sound?") Jane responded, "I need to know if the light makes a difference." You followed this later with a probe for operation move. ("What operation could you use to get that information?")

   Jane: "I don't know what to do to find out if the light makes a difference."

How do you respond?

T:

8. In reference to Jane's questions, you responded by using an operation clue giving move. ("You could experiment by changing something in the original event.") Now, after a period of time where she has performed two verification operations, she still hasn't found out if the light makes a difference.

How do you respond?

T:

9. Ralph has participated a total of six responses. Each time his response has been in the form of an idea statement or a theoretical data statement.

   Ralph: "Is the knife steel?"

How do you respond?

T:

10. Carol has responded for a total of six verification responses and she has shared three ideas. You have the feeling that she is not aware of what it is to experiment.

Carol: "Would it bend in the same direction if you held it on its side, and placed it over the flame?"

How do you respond?

T:

ANSWER SHEET   Handout 12.3

1. "What would you need to know to feel for certain that heat explains why it bends? (Probe for Data Move)

   Assumption is that teacher has provided time (three problem focuses and something over fifteen voluntary responses on his part) to test an idea. Teacher has decided to take away some of the student's autonomy by asking him to consider the data needed to test the idea.

2. "OK, I understand." (Accepting from the Allowing Inquiry Moves)

   Assumption is that the inquirer doesn't want the direction of the teacher at this point. So the teacher gives him full autonomy again.

   OR

   "OK, but what information would you need to feel that your explanation accounts for the bending knife?" (Probe for Data Move)

   Assumption is that inquirer didn't hear your first probe for data or he doesn't know what information he needs. At this point he is feeling unproductive and you have allowed time for him to deal with it on his own but he hasn't or can't. Now is the time to intervene again.

3. "What would you need to know in order to decide for youself if that's why it moves? (Probe for Data Move)

   Assumption is that Jack has had time to test his own idea but is dependent upon the teacher to say right or wrong. Time is right to take away a little of his autonomy because it isn't too productive for him yet.

4. "What do you mean, 'work the same way' and how are you putting it in the water and what is the water like?" (Probe for Specificity Move) [This probe could be broken up into separate questions or whatever number of questions it takes to make Paul's experiment more precise.]

   Assumption is that Paul can't sharpen up his data generating actions so they become more productive. You've allowed time for him to do so but now you've decided to step in and facilitate a little awareness. Once the data generating action is clear, you can provide the data.

5. "Brass expands at .000020 per 1.8°F of temperature change." (Responding to Data Probe from Allowing Inquiry moves)

   "Mary, now you're confirming or finding out about the behavior of the metals or the properties of the metal as we refer to them. This is different than verifying or confirming the name of the object. You've changed the subject of your operation from the name of the object (brass) to the property of the object (brass). (Identifying Inquiry Operation and Subject of Operations Moves)

Assumption is that Mary, and others in the class, have had a chance to become aware of the idea of subjects of operations but, as yet, this hasn't occurred. Now you've decided to facilitate awareness by identifying what she has done. This is only a slight infringement on her autonomy.

6. "You could experiment, that is, change something in the original event to see what would happen under new conditions." (Operation Clue Giving Move)

   Assumption is that Bob really is asking for some help so that he can be more productive in testing his idea. You've taken some of his autonomy but there is evidence that without doing so, Bob could not proceed on his own.

7. "You could experiment, that is, change something in the original event to see what would happen under new conditions." (Operation Clue Giving Move)

   Assumption is that Jane can't identify the operation on her own and, therefore, is unable to proceed on her own to test her idea.

8. "Jane, let me give you an idea of what you could do to test your idea. You could experiment by doing the original event over, except this time do it in a totally dark room to see what happens. By doing this experiment you could see if light really makes a difference." (Instructing Move)

   Assumption is that Jane, after being given time and after having responded, is unable on her own to take the step to test her idea. You decide to intervene, taking away her opportunity to decide but increasing, you feel, her power now to proceed on her own in similar conditions.

9. "No, the knife blade is not made of steel." (Responding to Data Probe Move)

   "You just acquired some information about the event by taking action to confirm something in the event that you saw or felt." (Identifying Products of Inquiry Data)

   Assumption is that Ralph may not be aware of what it is to evolve an idea and what it is to generate data. Since he has not performed a data generating operation, you feel that identifying the product of the action would help him become aware.

10. "Yes, it would" (Responding to Data Probe from Allowing Inquiry Moves)

"That was an experiment you just did. You changed the position of the blade from the original event to see what would happen." (Identifying Inquiry Operation)

Assumption is that identifying the operation will help make her aware of an experiment. This move takes away little of her autonomy.

VERIFICATION, EXPERIMENTATION, ANALOGY, NECESSITY, SYNTHESIS

Handout 12.4

SET I

1. "It moves because you have just the right amount of heat."
2. "If, instead of putting a hand on one ball, I put heat on one ball and cold on the other ball, would it go to the one that is colder?"
3. "When you put your hand on the ball does the red liquid heat up a little to give off a gas which forces the ball to fill up with gas, forcing the liquid into the other ball?"
4. "Is that a chemical in there?"
5. "Is that sulfuric acid in there?"

SET II

6. "It's the heat that makes it move, the heat from your hand."
7. "The pulse glass is like a heart pushing blood."
8. "Doesn't it move because the heat of your hand makes the red liquid vaporize so that it pushes out, and the vapor builds up until it can't go out anymore because of the pressure, so it pushes the liquid over?"
9. "If you did what you did the first time to make the liquid move, but when it starts moving, if you were to grab the tube between the two balls, would the liquid stop moving?"
10. "Does the thing work by the heat of your hand?"

SET III

11. "If your hand had no heat at all and you put it on one of the bulbs, would it work the same way?"
12. "If I put the glass in a refrigerator would the red liquid freeze?"
13. "Air makes it move like that."
14. "If you did the same thing in a room that was 30 degrees hotter, would it still work the same way?"
15. "The liquid moves because the heat repels it, pushes it away."

ANSWER SHEET

Handout 12.4

Possible Teacher Actions to Facilitate Autonomous Student Growth

1. "You have a theory that explains why the liquid moves." (IDENTIFYING INQUIRY PRODUCTS, THEORY)

   NOTE: This is the only move you would use unless you have information that the student hasn't generated any data to build or test his idea. If, over a period of time, you find the student not generating data, you might respond:

   > "What would you need to know in order for you to feel certain that's why it moves?" (TEACHER PROBE FOR DATA)

   If the student knows the information he needs, but over a period of time hasn't taken the action to get it, you might respond:

   > "What could you do to test your idea about just the right amount of heat?" (PROBE FOR OPERATIONS)

   If the student indicates he knows the information he needs but still doesn't know how to get it, you might respond:

   > "You could experiment with a different temperature to test your idea." (OPERATION CLUE GIVING)

   If the student knows the data generating action he could take to get the information he needs but still doesn't know specifically how to proceed, you might respond:

   > "To test your idea you could place a candle under one end of the pulse glass." (INSTRUCTING)

Possible Teacher Actions to Allow Inquiry

"OK, I understand your idea." (ACCEPTING)

"What do you mean by 'just the right amount of heat?'" (CLARIFYING)

Answer Sheet

Handout 12.4

	Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
2.	"You just did an experiment by changing the object used in the original event." (IDENTIFYING INQUIRY OPERATIONS) "Experimenting is one way of producing a datum." (IDENTIFYING INQUIRY PRODUCTS, DATA) NOTE: The teacher would want to provide the datum first. (RESPONDING TO DATA PROBE AND THEN IDENTIFY THE INQUIRY OPERATION OR INQUIRY PRODUCT)	"Yes." (RESPONDING TO DATA PROBE)
3.	"You are working on a theory that explains why the liquid moves. (IDENTIFYING INQUIRY PRODUCTS, THEORY) "What would you need to know to decide if that's why it works?" (TEACHER PROBE FOR DATA) NOTE: This move seems in order because the student has asked for confirmation of his theory indicating that he can't decide on his own. NOTE: If they know the student, over a period of time, can't proceed on his own, teachers can use any of the other moves found under Item No. 1.	"Well, you'll have to decide if that's why the liquid moves. It's not my role to say if that idea is right or wrong." (STRUCTURING)
4.	"You just confirmed what the object is in the pulse glass." (IDENTIFYING INQUIRY OPERATIONS) "Confirming or verifying is one way of generating data." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"Yes." (RESPONDING TO DATA PROBE) "What do you mean by chemical?" (CLARIFICATION)

Answer Sheet

Handout 12.4

	Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
5.	"You just verified the kind of liquid that isn't in the pulse glass." (IDENTIFYING INQUIRY OPERATIONS) "Verifying different parts of the event is one way you can get information." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"No." (RESPONDING TO DATA PROBE)
6.	"You're sharing a theory, your own idea, about why the liquid moves. (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: The teacher can use any of the other moves found under the answer to the Item No. 1 _if_ he knows the student, over a period of time, can't proceed on his own.	"OK." (ACCEPTING)
7.	"You have a theory, an idea that explains the working of the pulse glass." (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: The teacher can use any of the other moves found under the answer to Item No. 1, _if_ he knows the student, over a period of time, can't proceed on his own.	"OK." (ACCEPTING) "How do you mean, 'like a heart pushing blood?'" (CLARIFYING)
8.	"You're working on a theory." (IDENTIFYING INQUIRY PRODUCTS, THEORY) "What would you need to know to decide for yourself that's what makes it move?" (TEACHER PROBE FOR DATA)	"You are going to have to decide if that makes sense." "It isn't my job to say if an idea is good or bad." (STRUCTURING)

NOTE: Here, because the student is asking a question, there is some indication that he doesn't know how to decide on his own. Thus, the above move would seem to be appropriate. Any of the other moves found under the answer to Item No. 1 can also be used _if_ the teacher has additional data that the student can't proceed on his own.

Answer Sheet

Handout 12.4

	Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
9.	"You just experimented by changing the place where the pulse glass was held in the original event." (IDENTIFYING INQUIRY OPERATIONS) "You just got a datum through that experiment." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"No." (RESPONDING TO DATA PROBE)
10.	"You have a theory there." (IDENTIFYING INQUIRY PRODUCTS, THEORY) "What would you need to know to decide if that's how it works?" (TEACHER PROBE FOR DATA) NOTE: Here, because the student is asking a question, there is some indication that he doesn't know how to decide on his own. Thus, the above move would seem to be appropriate. Any of the other moves found under the answer to Item No. 1 can also be used *if* the teacher has additional data that over a period of time the student can't proceed on his own.	"It's your job to decide why it works that way." (STRUCTURING)
11.	"You have just done an experiment by changing the original condition of the hand." (IDENTIFYING INQUIRY OPERATIONS) "You got some information by experimenting." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"No." (RESPONDING TO DATA PROBE)
12.	"You just verified the properties of the liquid." (IDENTIFYING INQUIRY OPERATION AND SUBJECT OF THE OPERATION) "Tell me more about the temperature of the refrigerator." (PROBE FOR SPECIFICITY)	"No." (RESPONDING TO DATA PROBE)

Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
12. (Continued) NOTE: It would be difficult to provide data for this verification operation without knowing the temperature of the refrigerator. "Taking action to verify gives you information about the properties of liquids." (IDENTIFYING PRODUCTS OF INQUIRY, DATA)	
13. "You're stating a theory." (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: Teacher can use any of the other moves found under Answer No. 1, *if* he has the data that the student can't proceed on his own.	"OK, I understand your idea." (ACCEPTING)
14. "You just experimented by changing the condition of the room from what it was in the original event." (IDENTIFYING INQUIRY OPERATIONS AND SUBJECT OF OPERATION) "By experimenting, you can get certain kinds of data." (IDENTIFYING INQUIRY PRODUCTS, DATA) NOTE: As with all data generating actions, the teacher would respond to the data probe and then use one of the above moves if deemed important.	"No, probably not the same way." (RESPONDING TO DATA PROBE)
15. "You have a theory." (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: The teacher can use any of the moves found under the answer to Item No. 1, *if* he has data that over a period of time the student can't proceed on his own.	"OK." (ACCEPTING)

Name_________________________________ Date______________________

For each of the inquirer actions below, write:

A. How you would respond to the student.

B. What action the student is taking.

C. Why you responded the way you did.

1. Does the red stuff in the tube move because of light?

A.

B.

C.

2. I think that red stuff in there is like carbonated water. When you shook the glass, the liquid let off a gas, like when you shake a pop bottle. The gas makes pressure and pushes the liquid over.

A.

B.

C.

3. If the liquid was, oh, like 20 degrees hotter, would it still work?

A.

B.

C.

4. I'm not sure, but I think heat makes it move, but I need to know if you put something cold on it, that wasn't warm at all, would it still work?

A.

B.

C.

5. Could a fly live in the top of one of those little balls?

A.

B.

C.

6. Why does it bubble like that?

A.

B.

C.

7. Well, liquid boils at different degrees.

A.

B.

C.

8. If I wanted to know if cold would make it go, we could do the experiment by putting ice on it, to see if it would move...work.

A.

B.

C.

9. Well, were those bubbles, when you held it up, when it went to the arch, were those air bubbles, when it went up to the other red, to the gas...glass ball?

A.

B.

C.

10. It kind of looks like a thermometer.

A.

B.

C.

11. Well, for a while there, I thought it worked because of heat. Now I'm not sure because it also moves when something cold is on there.

    A.

    B.

    C.

SUBSET 13 152 Minutes
USING FACILITATING GROWTH MOVES

NOTES TO LEADERS

At Activity (d) it may be a good idea to stop and start the tape to give participants time to check with the guide sheets. They need to feel they can use the guide sheets in this activity.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 13
2. Tape recorder ready with TAPE C-III
3. Knife and pulse glass equipment available
4. Inquirer letters available
5. Arrangements completed for participants to work with students
6. PARTICIPANT MATERIALS

    13.1 Observer Guide: Inquirer Actions
    13.2 Observer Guide: Teacher Moves
    13.3 Inquirer Actions From the Knife Problem
    13.4 Producer's Time Interval Sheet

    15.2 Tuning In (READING ASSIGNMENT)

SUBSET 13

RATIONALE	MINUTES	SCHEDULE
a) The use of facilitating growth moves requires cyclical diagnosis and evaluation of the individual student by the teacher to maximize the opportunity for the student to productively decide for himself. The participant using his own problem focus can have a safe try at beginning to have inquirers become aware of the inquiry process and to use it independently of the teacher. He needs this safe try before practicing in the classroom.	3	a) Introduce Subset 13. Show SCHEDULE OF ACTIVITIES.
b) Participants can use observation guides to begin diagnosing autonomous student behavior and/or behavior which is the result of teacher intervention. Observers will be able to report such behavior to the teacher.	6	b) Refer to HANDOUTS 13.1 and 13.2.
c) Participants need time to get acquainted with guide and practice using it.	30	c) Give directions for using HANDOUT 13.3. Participants respond to Handout 13.3 and use answer sheet to compare their responses.

LEADER INPUT

a) In this exercise you will be:

1. Learning to use guide sheets to observe inquirer awareness of his actions and teacher use of facilitating growth moves
2. Presenting a problem to the small group for inquiry and trying to use some of the facilitating growth moves
3. Using the guide sheets to report on inquirer awareness and teacher use of facilitating growth moves

As leader, presenting the problem focus for inquiry, you will be making decisions about the use of the facilitating growth moves based on the degree to which the inquirers are aware of how they can proceed on their own.

b) The guides you will be using are HANDOUTS 13.1 and 13.2. Handout 13.1 contains inquirer actions that would indicate inquirer awareness of inquiry processes as well as behaviors that may be intuitive or without awareness. Handout 13.2 contains facilitating growth moves intended to help inquirers become aware, as well as allowing inquiry moves. Take five minutes to examine these guides and read the directions for their use. (Time 5 minutes)

c) To get some practice in identifying inquirer awareness using Handout 13.1, you will use HANDOUT 13.3. Directions for using this sheet are attached. Go ahead and try matching the inquirer actions with the awareness behaviors contained on Handout 13.1. (Time 30 minutes)

SUBSET 13

RATIONALE	MINUTES	SCHEDULE
d)	6	d) Give directions for listening to first 5 minutes of TAPE C-III and tallying inquirer actions on Handout 13.1.
e)	5	e) Replay first half of Tape C-III and have participants tally teacher responses using Handout 13.2.
f)	1	f) Explain leader, observer tasks in small groups, rotation of tasks and way observers report.

LEADER INPUT

d) To give you additional practice in using these guides, I am going to play TAPE C-III. I will play the first half of the tape and you will tally only inquirer actions, using Handout 13.1. I will replay the same portion of the tape and you will tally only teacher responses, using Handout 13.2. Since it may be difficult to identify specific inquirers on the tape, place all of your tallies in the Inquirer A column. I'll stop the tape halfway through and ask you to change guides.

[Time five minutes to point on tape where Ben says, "I'll answer some other questions while Charles is carrying out his experiment, Mike."] (Time 5 minutes)

e) Now, tally the teacher responses, using Handout 13.2. [Rewind tape and go to same point.]

There are four or five occasions on the tape where students are evidencing awareness of "data needed" and "operations to be used." Some of this awareness has come about as a result of facilitating growth moves. At the same time there are five or six occasions where there are no indications of awareness on the part of the students. The predominance of teacher moves are to allow inquiry. This is because students are after a lot of data and because the teacher has had to clarify many data probes. The teacher intervened to use three Probe for Operation moves, one Operation Clue Giving, one Instructing, one Identifying Inquiry Products, and one Identifying Inquiry operation.

f) You will be working in your small groups just as you did when you practiced your first problem focus. One member of the group will have the task of leader. Two members of the group will be observers. The remaining members of the group will be inquirers. This time, however, one observer will use Handout 13.1 and the other observer will use Handout 13.2. Inquirers will wear their "letters." Leaders will tape record their practice efforts. For each round there will be seven minutes of inquiry and eight minutes for observers to report. Observers should report in the following manner:

1. The observer using Handout 13.1 will report first, indicating the kind of awareness or other behavior exhibited by the individual inquirers.
2. The observer using Handout 13.2 will then report indicating the kinds of teacher moves used in responding to the individual inquirers.

This data will allow the leader to assess the degree to which inquirers are aware of inquiry processes and the degree to which he is facilitating awareness through the facilitating growth moves.

RATIONALE	MINUTES	SCHEDULE
g)	4	g) Ask the small groups to get set up, get recorders ready and have "letters" on inquirers.
h) This provides the teacher with the chance to use facilitating growth moves in terms of the actual behavior of inquirers which he has observed periodically during the workshop.	7	h) Start first round.
i)	8	i) Stop inquiry in first round and ask observers to report.
j)	80	j) Stop observer reports and start second round. Continue to start and stop small groups to begin each round and have observers report. (Seven minutes inquiry, eight minutes reporting.) [Have break after third round.]
k) Participants are ready to try using the moves in their own classroom. After making their tape they should be able to explain why they used a specific move. Their explanation should match the rationale given on HANDOUT 12.4.	2	k) Give directions for participants to make practice tape. Make knives available.

LEADER INPUT

g) Please get into your small groups and get ready for the first round. After the third round we will have a short break. (Time 4 minutes)

h) OK, start the first round. (Time 7 minutes)

i) Stop. Observers, please report. (Time 8 minutes)

j) Start the second round.

[Continue starting and stopping groups for each round and to have observers report. After third round, have a short break.] (Time 80 minutes)

k) Your next task will be to make your second practice tape working with students. Again the tape only need be 15 minutes. You will be practicing the facilitating growth and allowing inquiry moves, using the facilitating growth moves where you have evidence that the student can't proceed on his own. You may use the problem focus that you developed and tried here in the workshop or you may borrow one of the knives. You will be bringing the tape you produced for the next workshop activity. Members of your trio will listen to your tape and report to you using observer guides similar to the others. They will be concerned with the degree to which inquirers evidenced awareness of inquiry processes and the degree to which you used allowing inquiry and facilitating growth moves. You will have a chance to say why you used certain moves with particular students. In order for observers to identify easily the portions of the tape they are tallying, please listen to your tape and complete the Producer's Time Interval Sheet, HANDOUT 13.4. Have your tape and time interval sheet ready for the next activity.

After listening to your tape to complete the time interval sheet, you may wish to listen to it again using Handouts 13.1 and 13.2. (Time 2 minutes)

SUBSET 13

RATIONALE	MINUTES	SCHEDULE
1)		1) Give directions for participants to read HANDOUT 15.2 by the next meeting time.

LEADER INPUT

1) AFTER YOU MAKE YOUR PRACTICE TAPE AND PRIOR TO OUR NEXT MEETING, PLEASE READ HANDOUT 15.2. This paper will identify your third set of moves.

OBSERVER GUIDE:
Inquirer Actions

Handout 13.1

Directions

1. Read down the left column to become familiar with the inquirer action items.

2. Observe the action of the student and judge it to be:

   a. Evidencing awareness of inquiry processes (Items 1-6)*

   b. Not evidencing awareness of inquiry processes (Items 8-9)**

3. Tally in the proper time period opposite the item which describes the inquirer action.

4. Proper tallying is important because:

   a. Inquirer action tallies will be compared with teacher move tallies

   b. Teacher needs to be aware of inquirer actions and his tactical moves

5. Consider correlation of problem focus with established criteria:

   Does the problem focus meet the established criteria?

   Yes ____

   No ____ Identify the areas where the problem focus does not meet the established criteria.

---

*Items 1-6 on the observer guide are descriptions of student behavior which indicate awareness of inquiry processes. The student must be doing or saying those things described in items 1-6 before the student action can be tallied as awareness behavior.

**Item No. 7 refers to a generating data or an evolving idea action the student is taking but where there is no evidence that he is aware of the actions he is taking. Evidences of awareness are described in items 1-6 on the guide.

OBSERVER GUIDE:
Inquirer Actions

Handout 13.1

		Inquirer A	Inquirer B	Inquirer C	Inquirer D
Student Awareness	1. AWARE OF HIS DATA GENERATING OPERATIONS AND SUBJECT OF OPERATIONS Names, describes operations and subject of operations; messes with subject(s); talks about what he is doing.				
	2. AWARE OF HIS PRODUCTS OF INQUIRY Names or describes a datum or a theory.				
	3. AWARE OF STATING A PRECISE DATUM PROBE Data generating operation contains time referent, specific object and explicit state of object.				
	4. AWARE OF WHAT DATA HE NEEDS Talks about data he needs or has gotten; subjects of idea and data generating action are the same.				
	5. AWARE OF OPERATION USEFUL TO GET A DATUM HE IDENTIFIES AS NEEDED Talks about an operation he would use; subjects of idea and data generating action are the same; identifies operation (not just describes what he would do).				
	6. AWARE OF HOW TO BEGIN TO DEVELOP OR TEST AN IDEA Identifies action to build or test idea; checks out an assumption (shown by logical relationship between data generated and idea).				
Without Awareness	7. INQUIRER ACTIONS WITHOUT AWARENESS Expressing Idea; Generating Data; Problem Focus Question; Theoretical Data Statement.				
Other	8. OTHER STUDENT ACTIONS Student takes actions other than those listed.				
	9. TALK NOT CLEAR Student talk is not understandable.				

OBSERVER GUIDE:
Inquirer Actions

Handout 13.1

		Inquirer A	Inquirer B	Inquirer C	Inquirer D
Student Awareness	1. AWARE OF HIS DATA GENERATING OPERATIONS AND SUBJECT OF OPERATIONS Names, describes operations and subject of operations; messes with subject(s); talks about what he is doing.				
	2. AWARE OF HIS PRODUCTS OF INQUIRY Names or describes a datum or a theory.				
	3. AWARE OF STATING A PRECISE DATUM PROBE Data generating operation contains time referent, specific object and explicit state of object.				
	4. AWARE OF WHAT DATA HE NEEDS Talks about data he needs or has gotten; subjects of idea and data generating action are the same.				
	5. AWARE OF OPERATION USEFUL TO GET A DATUM HE IDENTIFIES AS NEEDED Talks about an operation he would use; subjects of idea and data generating action are the same; identifies operation (not just describes what he would do).				
	6. AWARE OF HOW TO BEGIN TO DEVELOP OR TEST AN IDEA Identifies action to build or test idea; checks out an assumption (shown by logical relationship between data generated and idea).				
Without Awareness	7. INQUIRER ACTIONS WITHOUT AWARENESS Expressing Idea; Generating Data; Problem Focus Question; Theoretical Data Statement.				
Other	8. OTHER STUDENT ACTIONS Student takes actions other than those listed.				
	9. TALK NOT CLEAR Student talk is not understandable.				

OBSERVER GUIDE:
Inquirer Actions

Handout 13.1

		Inquirer A	Inquirer B	Inquirer C	Inquirer D
Student Awareness	1. AWARE OF HIS DATA GENERATING OPERATIONS AND SUBJECT OF OPERATIONS Names, describes operations and subject of operations; messes with subject(s); talks about what he is doing.				
	2. AWARE OF HIS PRODUCTS OF INQUIRY Names or describes a datum or a theory.				
	3. AWARE OF STATING A PRECISE DATUM PROBE Data generating operation contains time referent, specific object and explicit state of object.				
	4. AWARE OF WHAT DATA HE NEEDS Talks about data he needs or has gotten; subjects of idea and data generating action are the same.				
	5. AWARE OF OPERATION USEFUL TO GET A DATUM HE IDENTIFIES AS NEEDED Talks about an operation he would use; subjects of idea and data generating action are the same; identifies operation (not just describes what he would do).				
	6. AWARE OF HOW TO BEGIN TO DEVELOP OR TEST AN IDEA Identifies action to build or test idea; checks out an assumption (shown by logical relationship between data generated and idea).				
Without Awareness	7. INQUIRER ACTIONS WITHOUT AWARENESS Expressing Idea; Generating Data; Problem Focus Question; Theoretical Data Statement.				
Other	8. OTHER STUDENT ACTIONS Student takes actions other than those listed.				
	9. TALK NOT CLEAR Student talk is not understandable.				

OBSERVER GUIDE:
Teacher Tactical Moves

Directions

1. Read down the left column to become familiar with the teacher moves.

2. Observe the move of the teacher and judge it to be:

    a. Facilitating Student Awareness (Items 1-7)

    b. Allowing Inquiry (Item 8)

    c. Other (Item 9)

3. Note the inquirer to whom the teacher is responding and tally in the proper column opposite the item which describes the teacher move.

4. Proper tallying is important because:

    a. Teacher moves will be compared with inquirer actions

    b. Teacher needs to be aware of how he is responding to inquirer actions.

5. Consider correlation of the problem focus with established criteria:

    Does the problem focus meet the established criteria?

    Yes ____

    No ____ Identify the areas where the problem focus does not meet the established criteria.

OBSERVER GUIDE:
Teacher Tactical Moves

Handout 13.2

		Inquirer A	Inquirer B	Inquirer C	Inquirer D
Facilitating Growth	1. IDENTIFYING INQUIRY OPERATIONS, SUBJECTS OF OPERATIONS Teacher identifies, describes or labels the verification or experimentation operation and/or the subject of the verification operation an inquirer has just used.				
	2. IDENTIFYING INQUIRY PRODUCTS A DATUM AND A THEORY Teacher identifies, describes or labels a theory and/or or a datum an inquirer has just produced.				
	3. PROBE FOR SPECIFICITY Teacher asks the student to include additional details in his data probe operation so the specific data the inquirer wants is identified.				
	4. TEACHER PROBE FOR DATA Teacher asks a student what he would need to know in order to begin to build or test a theory.				
	5. TEACHER PROBE FOR OPERATION Teacher asks a student what data generating action he would take to get the information he needs to test an idea.				
	6. OPERATION CLUE GIVING Teacher tells a student a data generating operation that he might use to get the datum he has identified.				
	7. INSTRUCTING Teacher gives a student an example of a data generating action which includes the subject of the action.				
Allowing Inquiry	8. TEACHER USES AN ALLOWING INQUIRY MOVE Focus Setting; Structuring, Clarifying; Accepting, Responding to Data Probe; Teacher Silence				
Other	9. OTHER TEACHER ACTIONS Teacher takes actions other than those listed here.				
	10. TALK NOT CLEAR Teacher talk is not understandable.				

INQUIRER ACTIONS FROM
THE KNIFE PROBLEM

Directions

In this exercise you will be analyzing a single inquirer action or a series of inquirer actions to determine if they show evidence of inquirer awareness of the inquiry processes. Items 1-6 of Handout 13.1 contains inquirer actions that would indicate an awareness of what he is doing and what he can do to proceed on his own.

To complete the exercise:

1. Read the actions for each of the inquirers on the following pages.
2. Decide if the actions show evidence of awareness (Items 1-6 on Handout 13.1).*
3. On the line provided write in the item number(s) from Handout 13.1 which describes the evidence shown.
4. If the actions do not show evidence of awareness, write on the line provided, either item number 7 or 8.
5. After you have tried the first five, check your answers with the answer sheet.
6. Go on to respond to the remaining inquirer actions. Check your last sixteen answers with the answer sheet. If you disagree with the answer sheet, seek clarity with one of your trio members.

*Items 1-6 on Handout 13.1 are descriptions of student behavior which indicate awareness of inquiry processes. The student must be doing or saying those things described in items 1-6 before the student behavior can be tallied as awareness behavior.

INQUIRER ACTIONS FROM
THE KNIFE PROBLEM

Handout 13.3

INQ. 1. "I need to know if the water has anything to do with it."

"If you didn't put it in the water, would it still straighten out?" _____

INQ. 2. "Does the kind of knife it is make any difference? _____

INQ. 3. "I'm doing an experiment. If you heated the knife on the other side, would it still bend?" _____

INQ. 4. "If you heat the tin side, it bends the same as when you heat the copper side, and I want to find out why."

"If you reversed the metals on the blade, would it still bend the same?" _____

INQ. 5. "Is the knife like a regular table knife?" _____

INQ. 6. "I think the knife is something like paper in a fire when it kind of curls up. That gives me an idea. I think the fire has more pressure than the air. I think that's why it is bending that way. Only the tin sort of gets me fouled up!"

_____ "If I put a plain piece of tin in the fire, would it expand?"

INQ. 7. "That experiment we just did says that copper contracts faster than tin and expands faster than tin."

INQ. 8. "I think when you heat the knife the molecules only expand in that one spot."

"If you heat the knife blade in only one spot, how far apart do the molecules spread?" _____

INQ. 9. "Copper expands faster than tin."

"Does copper expand faster than tin?"

"Then that's why the blade bends, because the copper is pushing it." _____

INQ. 10. "I need to find out how much the blade expands." _____

Inquirer Actions From
The Knife Problem

Handout 13.3

INQ. 11. "If you put ice on the blade, would it still bend the same way? I need to know in order to test my theory. My theory is that the heat makes it bend one way and the cold will make it bend another way."

_____

INQ. 12. "Why does it do that? I think it is a trick."

_____

INQ. 13. "The reason it bends is because the ice is colder than the water."

"Is that warm or cold water in there?"

_____

INQ. 14. "It bends because the metals expand at different rates. Is that right?"

_____

INQ. 15. "Cold water makes things get smaller."

_____

INQ. 16. "The way it bends depends on what side you put in the flame."

"If you put the other side in the flame, will it bend the same way?"

_____

INQ. 17. "The two strips of metal have to be together before it will work."

"The two strips of metal are joined, aren't they?"

_____

INQ. 18. "I think the blade bends because the brass is heavier than the tin and it bends toward the brass side."

"Which is heavier, the brass or the tin?"

"We could put the brass side down over the flame and see if it still bends down."

_____

INQ. 19. "Is that water in the jar? Well, I think the knife melts."

_____

INQ. 20. "Would it still bend if the blade were an inch thick?"

"Would it bend if it were 2 inches thick?"

"Would it bend if it were 3 inches thick?"

"I think it would bend no matter how thick it was if you had enough heat."

_____

Inquirer Actions From The Knife Problem

Handout 13.3

INQ. 21. "Did the blade bend toward the gold colored side when you held it in the flame the first time?"

"Is the gold side of the knife brass?"

"Was the brass at room temperature to begin the experiment?"

"Does a piece of brass weigh more than a piece of tin of the same size and purity?"

______

ANSWER SHEET FOR INQUIRER ACTIONS

Handout 13.3

Inquirer	Item	
1.	4, 5	Inquirer says what data he needs and uses an experiment to get the information.
2.	7	Although the inquirer *may* be aware of how to proceed on his own, by itself this statement doesn't indicate any awareness. In fact, by this statement he is asking the teacher to judge his idea.
3.	1	Student indicates awareness of an operation because he labels it and the operation he performs is consistent with the label he attaches. If he had said, "Is the handle made of wood?" this would not indicate awareness because he has labeled the operation *experiment* but the operation he performs is *verification*.
4.	4, 5, 6	Student indicates awareness of the data he needs and also how to test an idea because there is a common subject (*condition* of the metals) in both the idea statement and the experiment operation used to get the information.
5.	7	Although the inquirer may be aware of how to proceed on his own to build and test his idea, this single response does not provide any evidence. Subsequent and/or prior behavior linked to this statement, however, may indicate awareness. Teacher must be able to link responses which occur before and after.
6.	5, 6	Inquirer indicates that the object "tin" (or perhaps the properties of tin) have him baffled. However, he immediately uses the object tin to verify its behavior when heated. This use of the same subject (object tin or property of tin) is found in both the idea statement and the data generating question. This would suggest awareness of what he needs to know and the operation useful in getting it.
7.	1 or 7	Inquirer labeled the operation as an experiment. This would indicate awareness of the operation, if that which he labeled was an experiment. If he has incorrectly labeled, then he is not aware. In this example, we are not sure because we don't know the operation to which he refers.
8.	4, 5, 6	Inquirer indicates awareness of what he needs to know and the operation to get it because of the common subject of his idea and the data generating operation (condition of molecules). For the same reason this suggests that he is aware of how to test an idea on his own.

Answer Sheet for Inquirer Actions

Handout 13.3

Inquirer	Item	
9.	6	Inquirer indicates he is aware of how to build an idea. He states an assumption and immediately checks it out through a verification operation. Then he goes on to use the same subject (property of copper) to state an idea which explains the behavior of the knife.
10.	4	Inquirer demonstrates he is aware of what he needs to know. We are not sure if he is building or testing an idea.
11.	4, 6, 2	Inquirer indicates the information he needs and performs an experiment to get the datum. This would indicate awareness of data needed and the operation necessary to get it. He goes on to include the same subject (object ice) in an idea statement explaining the behavior of the knife. This indicates awareness of how to test an idea which in this example is further supported by his own words, "in order to test my theory."
12.	7	No evidence here that the inquirer is aware of data generating operations and ideas so that he can proceed on his own.
13.	6, 4	Inquirer is sharing an idea which contains an assumption. He checks on the assumption (the water is warm) and his idea (cold makes it bend) by verifying the temperature of water. This indicates awareness of how to test an idea.
14.	7	Nothing in the statement to indicate awareness. In fact, one might assume that he is not aware of how to proceed on his own when he raises the question, "Is that right?"
15.	7	Nothing in the statement to indicate awareness of how to proceed.
16.	6, 4	Inquirer states an idea and performs a data generating operation both containing the same subject (condition of blade as it is put in flame). This indicates awareness of how to build and test an idea.
17.	6	Inquirer making an assumption in an idea statement and then checking out the assumption. This indicates awareness of how to build and test an idea.

Answer Sheet for Inquirer Actions

Handout 13.3

Inquirer	Item	
18.	5, 6, 4	Inquirer indicates awareness of how to build and test an idea as he makes a statement and then performs a data generating operation, both having the same subject (property of brass and tin). This, of course, indicates that he knows what operation to use to get the data he needs.
19.	7	There are no indications in this statement that the inquirer is aware of how to proceed on his own.
20.	1, 6	The inquirer indicates an awareness of the data generating process by performing a series of data generating operations keeping the subject of the operation (condition of blade) constant. He also indicates an awareness of how ideas are developed as he states an idea where subject (condition of blade) corresponds with the subject of the data generating operation performed previously.
21.	1, 3	Inquirer indicates an awareness of subject of data generating operation as he performs data generating operations using all of the subjects (event, object, condition, property). All of the actions are precise data probes.

PRODUCER'S TIME INTERVAL SHEET

Handout 13.4

Producer's Name______________________________ Date__________________________

If the procedure for completing this form is unclear, review page 215, Handout 9.3.

Time Period (Two minutes each)	Period Boundaries
1	Period begins with: Period ends with:
2	Period begins with: Period ends with:
3	Period begins with: Period ends with:
4	Period begins with: Period ends with:
5	Period begins with: Period ends with:

SUBSET 14 66 Minutes
ASSESSING SECOND PRACTICE TAPE

NOTES TO LEADERS

It is important in this subset for the listeners to have a chance to identify correctly the inquirer and teacher behavior. During the eight-minute tape playing period it is recommended that listeners take what time they need to listen and think about each behavior being identified and tallied. It is better to take fewer behaviors and go away knowing they have been identified correctly than to try to take all the behaviors on the tape and end feeling frustrated.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 14

2. PARTICIPANT MATERIALS

   14.1 Listener Guide: Inquirer Actions
   14.2 Listener Guide: Teacher Actions

SUBSET 14

RATIONALE	MINUTES	SCHEDULE
a) Participants must have a chance to assess their practice efforts through accurate, open feedback. In learning this set of moves they also must have the chance to share their own reasons for using specific facilitating growth moves with specific students at a specific time.	3	a) Introduce Subset 14. Show on SCHEDULE OF ACTIVITIES.
b) Participants acting as listeners and using listening guides can give accurate data to the producer. The producer, in turn, can match the data reported with his own intention and determine the degree of consistency between his intent and his actions. Using two listeners to record and report data will increase skills and reliability of listeners. Participants need opportunity to review guide before they use it if they are to use it effectively.	4	b) Refer to HANDOUTS 14.1 and 14.2. Ask participants to review the categories of behavior.
c)		c) Give directions for using time interval sheets.
d) Participants need to understand clearly the different tasks and the method used to complete them.	2	d) Give directions for trio members to play practice tapes and to report.

LEADER INPUT

a) For this exercise you will be:

1. Playing your practice tape in your trio
2. Using guides to assess the degree of inquirer awareness and the degree to which the leader uses facilitating growth moves to increase student awareness of inquiry processes
3. Saying why you responded the way you did to individual inquirers

The objectives are for the listeners to provide as accurate data as possible to the producer and for the producer to report why he responded as he did to particular inquirers.

b) Listeners will be using HANDOUTS 14.1 and 14.2. The items on the guides are identical to those on HANDOUTS 13.1 and 13.2. However, the columns for tallying have been revised. Take four minutes to become reacquainted with the guides. (Time 4 minutes)

c) You notice that listeners will be tallying by time periods. Each of you have completed a time interval sheet that denotes the different time periods shown on the guide. As the producer plays his tape, he will have his time interval sheet in front of him. As the tape plays, he will listen to the tape and observe his time interval sheet so that he can tell listeners when to begin tallying in another time period column. Just as he did in Subset 10, he can talk over the tape to tell them, "Go on to the next column," or he can stop the tape.

d) One member of the trio should volunteer to play his tape. He is called the producer. The second and third members are listeners. One listener will use Handout 14.1 and the other, Handout 14.2. Since one listener will be listening for inquirer awareness and the other for teacher moves, the producer will stop the recorder after each teacher response to an inquirer. LISTENERS, YOU WILL LISTEN TO THE APPROPRIATE SPEAKER AND MAKE A TALLY MARK OPPOSITE THE BEHAVIOR ON THE GUIDE SHEET IN THE PROPER COLUMN. FOR EACH TAPE STOP, BOTH LISTENERS WILL BE MARKING THEIR INDIVIDUAL GUIDE SHEETS. After listeners mark, the producer starts the recorder for the next student action and teacher move. You will

SUBSET 14

	RATIONALE	MINUTES		SCHEDULE
d)			d)	Continued
e)	Listeners will be able to tell when the producer has used facilitating growth moves indiscriminately or when he is really diagnosing the degree of freedom which individuals can handle productively.	8	e)	Trio members start first round.
f)		11	f)	Stop tape playing and ask listeners to report.
g)		8	g)	Stop first round reporting and ask trio member to start second round.
h)		11	h)	Stop tape playing and ask second round listeners to report.
i)		8	i)	Stop second round reporting and ask trio member to start third round.

Assessing Second Practice Tape

LEADER INPUT

d) have 8 minutes for playing a practice tape and 11 minutes for listeners to report on the inquirer and teacher behavior.

The listener using Handout 14.1, Inquirer Behavior, will report first, telling the kind of inquirer behavior evidenced. Then the listener using Handout 14.2 will report on the teacher moves used. If either listener is uncertain of some of his tallies he can identify the time period in which the questionable behavior occurred and the producer can find it on the tape. All trio members then can become involved in identifying the behavior.

Allow time during the listener report period in each round for the producer to select one of the 2-minute time periods where (if at all) he used facilitating growth moves as reported by the listener. He will replay this portion of the tape and after each of his moves, stop the recorder and say why he responded the way he did. THE IDEA IS FOR LISTENERS TO LEARN TO IDENTIFY INQUIRER AND TEACHER BEHAVIOR AND FOR THE PRODUCER TO BE PROVIDED WITH A PICTURE OF HIS OWN MOVES AND ASKED TO TELL WHY HE USED THEM.

Spread out so that recorders do not interfere with one another and begin the first round.

e) [Check to see that producers are calling out time periods and starting and stopping recorders.] (Time 8 minutes)

f) Listeners, please report to the producer. Following your reports the producer will say WHY he responded the way he did to inquirers from one 2-minute portion of the tape. Producers, try to choose a 2-minute period where you used facilitating growth moves. (Time 11 minutes)

g) Will the second producer play his tape? (Time 8 minutes)

h) Listeners, please report to the producer. Producer, say WHY you responded the way you did. (Time 11 minutes)

i) Please start the next round with the third producer's tape. (Time 8 minutes)

SUBSET 14

RATIONALE	MINUTES	SCHEDULE
j)	11	j) Stop tape playing and ask third round listeners to report.
k)		k) Remind participants of third problem focus.

LEADER INPUT

j) The listeners should report now to the producers. The producer should say WHY he responded the way he did. (Time 11 minutes)

k) AFTER THE NEXT ACTIVITY, YOU WILL BE NEEDING YOUR THIRD PROBLEM FOCUS. KEEP WORKING TO BUILD PROBLEM FOCUSES THAT MEET THE CRITERIA.

LISTENER GUIDE: Handout 14.1
Inquirer Actions

Directions

1. Read down the left column to become familiar with the inquirer action items.

2. Observe the action of the student and judge it to be:

    a. Evidencing Awareness of inquiry processes (Items 1-6)*

    b. Not evidencing Awareness of inquiry processes (Items 8, 9)**

3. Tally in the proper time period opposite the item which describes the inquirer action.

4. Proper tallying is important because:

    a. Inquirer action tallies will be compared with teacher move tallies.

    b. Teacher needs to be aware of inquirer actions and his tactical moves.

5. Consider correlation of the problem focus with established criteria:

Does the problem focus meet the established criteria?

Yes_____

No _____ Identify the areas where the problem focus does not meet the established criteria.

*Items 1-6 on observer guide are descriptions of student behavior which indicate awareness of inquiry processes. The student must be doing or saying those things described in items 1-6 before the student action can be tallied as awareness behavior.

**Item No. 7 refers to a generating data or an evolving idea action the student is taking but where there is no evidence that he is aware of the actions he is taking. Evidences of awareness are described in items 1-6 on the guide.

LISTENER GUIDE:
Inquirer Actions

Handout 14.1

		Time Period 1	Time Period 2	Time Period 3	Time Period 4	Time Period 5
Student Awareness	1. AWARE OF HIS DATA GENERATING OPERATIONS AND SUBJECT OF OPERATIONS Names, describes operations and subject of operations; messes with subject(s); talks about what he is doing.					
	2. AWARE OF HIS PRODUCTS OF INQUIRY Names or describes a datum or a theory.					
	3. AWARE OF STATING A PRECISE DATUM PROBE Data generating operation contains time referent, specific object and explicit state of object.					
	4. AWARE OF WHAT DATA HE NEEDS Talks about data he needs or has gotten; subjects of idea and data generating action are the same.					
	5. AWARE OF OPERATION USEFUL TO GET A DATUM HE IDENTIFIES AS NEEDED Talks about an operation he would use; subjects of idea and data generating action are the same; identifies operation (not just describes what he would do).					
	6. AWARE OF HOW TO BEGIN TO DEVELOP OR TEST AN IDEA Identifies action to build or test idea; checks out an assumption (shown by logical relationship between data generated and idea).					
Without Awareness	7. INQUIRER ACTIONS WITHOUT AWARENESS Expressing Idea; Generating Data; Problem Focus Question; Theoretical Data Statement.					
Other	8. OTHER STUDENT ACTIONS Student takes actions other than those listed.					
	9. TALK NOT CLEAR Student talk is not understandable.					

LISTENER GUIDE: Handout 14.2
Teacher Tactical Moves

Directions

1. Read down the left column to become familiar with the teacher moves.

2. Observe the move of the teacher and judge it to be:

   a. Facilitating Student Awareness (Items 1-7)

   b. Allowing Inquiry (Item 8)

   c. Other (Item 9)

3. Tally in the proper time period opposite the item which describes the teacher move.

4. Proper tallying is important because:

   a. Teacher moves will be compared with inquirer actions

   b. Teacher needs to be aware of how he is responding to inquirer actions

5. Consider correlation of the problem focus with established criteria:

   Does the problem focus meet the established criteria?

   Yes_____

   No _____ Identify the areas where the problem focus does not meet the established criteria.

LISTENER GUIDE
Teacher Tactical Moves

Handout 14.2

		Time Period 1	Time Period 2	Time Period 3	Time Period 4	Time Period 5
Facilitating Growth	1. IDENTIFYING INQUIRY OPERATIONS, SUBJECTS OF OPERATIONS Teacher identifies, describes or labels the verification or experimentation operation and/or the subject of the verification operation an inquirer has just used.					
	2. IDENTIFYING INQUIRY PRODUCTS, A DATUM AND A THEORY Teacher identifies, describes or labels a theory and/or a datum an inquirer has produced.					
	3. PROBE FOR SPECIFICITY Teacher asks the student to include more details in his data probe so the specific data the inquirer wants is identified.					
	4. TEACHER PROBE FOR DATA Teacher asks a student what he would need to know in order to build or test a theory.					
	5. TEACHER PROBE FOR OPERATION Teacher asks a student what data generating action he would take to get the information he needs to test an idea.					
	6. OPERATION CLUE GIVING Teacher tells a student a data generating operation that he might use to get the datum he has identified.					
	7. INSTRUCTING Teacher gives a student an example of a data generating action which includes the subject of the action.					
Allowing Inquiry	8. TEACHER USES AN ALLOWING INQUIRY MOVE Focus Setting; Structuring, Clarifying, Accepting, Responding to Data Probe; Teacher Silence					
Other	9. OTHER TEACHER ACTIONS Teacher takes actions other than those listed here.					
	10. TALK NOT CLEAR Teacher talk is not understandable.					

SUBSET 15 103 Minutes
TUNING IN MOVES

NOTES TO LEADERS

Participants need to understand all the possible moves in response to the inquirer action at Activity (f). You may find you need to remind the answer man to read all the possible moves.

Some participants will continue to be bothered by terms used to describe the tuning in moves.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 15

2. Tape recorder ready with TAPE C-IV

3. Preparation completed for demonstration of diving dropper (Glass Cylinder, Rubber Sheeting and Eye Dropper)

4. PARTICIPANT MATERIALS

15.1	The Diving Dropper
15.2	Tuning In
15.3	Verification, Experimentation, Analogy, Necessity, Synthesis
15.4	Answer Sheet: Possible Tuning In Moves
15.5	Answer Sheet: Possible Facilitating Growth and Allowing Inquiry Moves
15.6	Classroom Interaction

SUBSET 15

	RATIONALE	MINUTES	SCHEDULE
a)	In addition to using those moves which allow inquiry and facilitate growth, the participant needs to learn to use an additional set of moves designed to check student perceptions and attitudes if he is to diagnose student growth.	3	a) Introduce Subset 15. Show SCHEDULE OF ACTIVITIES.
b)	Participants need to be aware of the conditions during the recorded inquiry activity if they are to attend to the teacher behavior. Participants will better understand the written concepts if they first listen to a recorded situation where the concepts are being used.	3	b) Describe TAPE C-IV and demonstrate Diving Dropper problem.
c)		4	c) Refer to Diving Dropper problem, HANDOUT 15.1.
d)		10	d) Give directions for listening and play Tape C-IV.

LEADER INPUT

a) Ultimately, we are looking for students to view themselves as idea producers, as having the means for using concrete experience to derive abstract meaning and personal knowledge and as valuing rational processes for making judgments. Such student perceptions and attitudes often become evident as they grow in their autonomous use of the inquiry process. On the other hand, the teacher often needs to make it possible for students to share the way things seem to them. The TUNING IN moves are intended for this purpose. They are used selectively as students show enough awareness of the process to begin forming judgments about it. The teacher will generally intervene with these moves only after using those which allow inquiry and facilitate autonomous student growth.

In this exercise you will:

1. Hear a tape where the teacher is beginning to use tuning in moves
2. Read a paper describing the intents and actions of the teacher
3. Practice using the tuning in moves

The objectives are to name the tuning in moves and to try using them in response to inquirer actions.

b) I will play a tape recording where the teacher is beginning use the tuning in moves. The students and the teacher are the same as before. This is the fourth problem focus that the students have worked on. The original one-hour tape was cut in two or three places to obtain a ten-minute tape that would be representative of the entire activity.

Let me first show you the problem the teacher gave to the students. (Demonstrate Diving Dropper)

c) So that you know something about the problem as you listen to the tape, take about 4 minutes to read the problem summary, HANDOUT 15.1. (Time 4 minutes)

d) As you listen to the students and teacher interacting on the tape, see if you can detect the tactical moves the teacher uses to reveal students' perceptions and attitudes of the inquiry process. (Tape runs 10 minutes)

	RATIONALE	MINUTES		SCHEDULE
e)	Participant's conceptions and perceptions will change as a result of formal conceptual input. Some of his conceptions will be reinforced and made clearer by the formal conceptual input. He will be aware of his informal knowledge and his formal knowledge will expand.	11	e)	Refer to HANDOUT 15.2 and give directions for reviewing.
f)	Participant's understanding of the conceptual input will be facilitated by his applying the new concepts to some inquirer behavior and teacher moves with which he is familiar. HANDOUT 15.4 will indirectly provide participants with a rationale for using the tuning in moves in response to inquirer actions.	47	f)	Give information on trio practice and refer participants to HANDOUTS 15.3, 15.4 and 15.5.
g)	Participant's expanding skill in facilitating inquiry will be reflected in the differences between his earlier responses to these actions and his present responses.	25	g)	Give directions for completing HANDOUT 15.6 and comparing with first and second responses.
h)			h)	Remind participants of fourth problem focus.

LEADER INPUT

e) HANDOUT 15.2 contains some (1) philosophical and logical considerations to be given to inquiry processes, and (2) tactical moves described as teacher intentions and actions. These can be used to reveal student perceptions and attitudes of the inquiry processes. By yourself, review the paper, paying particular attention to the intent of each of the moves. After you have reviewed the paper, see if you can name the moves to yourself. (Time 11 minutes)

f) You now have a third set of moves which increase the alternate ways for responding to students. To provide practice in using some of the tuning in moves and to demonstrate how these moves provide alternate responses to students, we will use some of the same student responses which we used in learning inquirer behavior.

Each trio will use ONE copy of HANDOUT 15.3 and ONE copy of each of the answer sheets, HANDOUTS 15.4 and 15.5. Handouts 15.3 and 15.5 have been used previously to identify inquirer actions and practice facilitating growth moves. Handout 15.4 gives possible teacher responses to inquirer actions from the tuning in moves. As before, each trio has three roles: TEACHER, STUDENT and ANSWER MAN. The student will read an action and the teacher will respond with alternate responses from his full range of tactical moves allowing inquiry, facilitating growth and tuning in to students. He should make sure to try some tuning in moves during this exercise. THE ANSWER MAN THEN WILL READ ALL THE ALTERNATE RESPONSES FROM HANDOUTS 15.4 and 15.5. Rotate roles in your trio for each set as you have done in the past.

REMEMBER, have only one copy of each of the handouts in your trio for this practice. Don't look ahead on the answer sheets. This will spoil the opportunity for the teacher to respond spontaneously.

Get into your trios and begin with Set I. (Time 47 minutes)

g) Take a look at HANDOUT 15.6. You will remember it from past use. Complete it again, responding to inquirer actions, completing items A, B and C. Compare your responses with those given on the other occasions. Have you tried alternate responses? Have you been able to identify the intent of your responses? (Time 25 minutes)

h) AFTER THE NEXT TWO ACTIVITIES, YOU WILL NEED YOUR FOURTH PROBLEM FOCUS. KEEP WORKING TO DEVELOP FOCUSES THAT MEET THE CRITERIA.

I. MEANS BY WHICH FOCUS IS CREATED

A. Equipment

Medicine dropper, tall cylinder of water, rubber cover, large rubber band

B. Demonstration

Float a medicine dropper upside down on the surface of a tall cylinder of water. The eye dropper should be partially filled with water. (Experiment to get the right amount.) The dropper should float just at the surface, almost entirely submerged. Next, place a rubber cover over the top of the cylinder and seal it in place with a rubber band. When the rubber cover is pressed down, the dropper will fall to the bottom. After the pressure is removed, the dropper will remain at the bottom. Even after the rubber cover is removed, the dropper will remain in place. The dropper should begin to rise, however, when the rubber cover is replaced and pulled up.

C. Focusing Questions

1. Why does the dropper sink and then rise?
2. Why does the dropper remain on the bottom when the rubber cover is removed?
3. Why does the dropper remain at the top when the cover is removed?

II. PROBLEM ANALYSIS

A. Consequential Variables

1. The rubber cover must be sealed tight against the cylinder so that air cannot enter or leave.
2. The amount of air and water in the dropper is critical and you must have just enough of each so that the dropper floats at the surface of the water in the cylinder before the rubber sheet is put in place.
3. The size (diameter and height) of the cylinder is important. If you use one that is too short and fat, the dropper may not stay on the bottom when the rubber is removed. If the dropper is too tall and thin, the dropper may not rise off the bottom. (A tall olive jar works fine with an ordinary medicine dropper.) Of course, the size of the dropper and the amount of air in it will also affect its behavior where the size of the container is held constant.

II. PROBLEM ANALYSIS (Continued)

B. Attendant Data

1. At the beginning of the demonstration, there is a downward force due to the weight of the dropper and trapped air, and an upward buoyant force equal to that weight. (Archimedes' Principle)

2. When the rubber cover is placed over the cylinder and sealed in place, the atmospheric pressure above the water remains unchanged.

3. Pressure placed on the rubber cover by the hand compresses the air above the water surface into a small space, and increases the pressure on the water surface.

4. Water pressure pushing up into the dropper becomes greater and the air inside becomes compressed slightly until it exerts enough pressure to balance the water pressure.

5. When the air in the dropper is compressed, it displaces less water and the upward buoyant force decreases. If this buoyant force becomes less than the downward pull of gravity, the dropper begins to sink. After a certain depth the dropper will continue to sink after the teacher has released the cover because it is deep enough so the water pressure alone will keep the air compressed.

6. Removing the rubber cover does not change the pressure on the top surface of the water, since that pressure already returned to normal when the teacher removed his hand from the top cover.

7. When the cover is replaced and the teacher pulls upward on it, the air pressure above the water is reduced as the air expands into a larger volume. As this pressure reduces, the air in the dropper expands, displacing more water and increasing the buoyant force.

8. Again, after a certain depth, the dropper will continue to rise even after the teacher has released the cover; normal air pressure plus the water pressure at that depth cannot compress the air enough to make it sink.

II. PROBLEM ANALYSIS (Continued)

C. Scientific Principles

1. Archimedes' Principle

2. Pressure (Force Acting Upon a Unit Area of Surface)

3. Behavior of Gases Under Changes of Temperature and Pressure

Hayakawa[1] distinguishes between what it is to report, infer and judge.

REPORTS are statements:	Of things which are verifiable
INFERENCES are statements:	About the unknown made on the basis of the known
JUDGMENTS are statements:	Expressing approval or disapproval of persons, situations or objects being described

For example, a person's dress can be described using report, inference or judgment statements.

REPORT	"His shirt collar was open; his tie was around his neck, but not tied. There were two ink stains one-half inch in diameter on his shirt below the pocket. One shoe lace was untied and dragging on the floor."
INFERENCE	"He doesn't care about his appearance."
JUDGMENT	"He's sloppy and shouldn't be around kids."

Such distinctions, Hayakawa states, are important and necessary if people are to use language processes to reach agreement and understanding. For instance, report statements which are based on fact, have the greatest general usefulness because they say things in such a way that everyone will agree with their formulation.

Inferences, on the other hand, can be quite accurate or entirely wrong. They may be based on a wide background of previous experience and report statements, or they may be based on only casual observations and no experience at all. Therefore, inference statements should be recognized for what they are and changed to report statements to communicate accurately; or, report statements should be acknowledged along with the inference.

Because two or more people happen to judge a situation or a behavior in the same way, does not mean the situation or behavior has been verified and is therefore true. For instance, for another person to say, "You're right, he is sloppy" doesn't mean the statement is true. "Scientific verifiability rests upon the external observation of facts, not upon the heaping up of judgments."[2] The trial jury who judges the defendant to be "guilty of theft" is making an inference and passing judgment; it is not a fact that he is guilty of theft. It is only a fact that he is judged to be guilty. Hopefully, such inference and judgment statements would be based on a number of report statements coming from a number of eye witnesses.

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[1] Hayakawa, S. I. Language in Thought and Action. New York: Harcourt Brace Jovanovich, Inc., 1964, pages 39-44

[2] Ibid. page 43.

Hayakawa's concern is that people perceive the differences between the kinds of verbal statements they are making and the kinds of statements others are making. It is precisely this same perception of differences and attitudes about the differences that is looked for in inquirers. Whereas Hayakawa is analyzing the language statement, in inquiry the process action is analyzed. That is, the concern is placed on knowing how the individual perceives the inquiry process as a means for developing personal knowledge and understanding. More specifically, it is important to know if the inquirer perceives and values the following points of view:

1. Ideas* exist as entities apart from the person holding them. Although it is true individuals become emotionally involved, attached and defensive of their ideas, ideas are made, developed, bought and sold by individuals. Individuals have ideas much as they have material goods such as automobiles, houses and televisions. The fact that an idea is shown to be powerful or weak, valuable or worthless, doesn't mean the creator or owner of the idea is necessarily powerful or weak.
2. An idea is judged to be more or less powerful not by the individual originating it or holding it nor by the number of people agreeing with it. Ideas are judged to be more or less powerful by the degree to which they accurately reveal or explain the real world events and happenings. The more powerful the idea, the greater its accuracy in predicting and controlling new or recurring phenomenon.
3. Ideas are abstractions in the minds of people and are separate and distinct from real world events. We need to continually experience and interact with real world events to have ideas and to enable our ideas to grow continually. For instance, some of us can only "go so far" with some ideas because we just haven't experienced some parts of the world or because we just haven't lived long enough. Small children, for instance, cannot understand the mass of objects. That is, a child is shown two balls of clay which he says are equal size (and they are in fact). But, when one ball is made into a long, thin sausage shape and the other into a short, fat sausage shape, he will say there is more clay in the long thin sausage.[3] Also, many adults have an "idea" that there is an "Egypt," yet most have never been there or seen it and have never talked to anyone from there.
4. Ideas are temporary states, subject to growth, evolution, revision or rejection. Whereas the part of the real world which is being explained may remain relatively the same or unchanged, man's perception of that part, the data he has about it and his ability to generate new data about it contributes to the temporary state of ideas. New data can render an idea powerful or powerless.

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*The word *idea* as used here refers to theories, explanations, inferences and generalizations.

[3] For more information, see Flavell, John H. The Developmental Psychology of Jean Piaget. Princeton, New Jersey: Van Nostrand, 1966, page 246.

5. Scientific knowledge is derived through an inductive process: gathering data, making theories about the data, testing those theories with further data and so on. No inductive conclusions or scientific statement or theory can ever be proven true. They can be proven untrue or made more certain as more data is generated to confirm them.

6. Everyone has ideas and everyone is capable of building his own ideas. Ideas are not those things which only some people are capable of having, ideas are not just those things that you get from other people and from books. Personal ideas lead to personal knowledge, and personal knowledge brings personal satisfaction and personal power.

Some students already perceive the inquiry process in this light as indicated by:

a. Sharing two or more quite different ideas about a problem event

b. Saying the data available does or does not support an idea shared by the teacher

c. Stating what an idea explains and what it doesn't explain

d. Refusing to "vote" as a means of deciding which idea is best

e. Speaking out against ideas of peers by citing evidence which conflicts with the idea

f. Saying a theory is weak because they lack first-hand data

Where this happens, the teacher is quite naturally TUNED IN to the student's perceptions and attitudes concerning inquiry process actions. If, however, students do not make clear by their actions or words, how they perceive or feel about their own process actions, it is possible for the teacher to use some probing moves. These moves are introduced last because they are more direct inverventions into the student's inner state. There needs to be trust and communication between student and teacher if students are to respond honestly to these probes. They are not introduced last because they are less important. Together with the Facilitating Autonomous Growth Moves, they reveal, to an even greater extent, the degree to which the student is truly able to use the inquiry process autonomously. It is in response to these moves or in the voluntary actions cited above that the student reveals the degree to which he is free of and aware of prejudice, ego attachment and defensive action as he builds and tests his idea.

Workshop learning is concerned also with classroom verbal interaction skills. These reveal the feelings and attitudes of students toward inquiry processes. The following pages identify the specific tactical moves which the teacher can use to become aware of these feelings and attitudes.

Suchman identified the general conditions essential to inquiry and the growth of inquirers. Strasser,* building on Suchman's work, identified 22 categories of teacher verbal interaction, called TACTICAL MOVES, which the teacher uses to facilitate inquiry. Here, the 22 tactical moves have been reduced to 18 and reorganized to simplify learning and practice.

ALLOWING INQUIRY TO HAPPEN

1. Focus Setting
2. Structuring
3. Clarifying
4. Accepting
5. Responding to Data Probe
6. Teacher Silence

FACILITATING AUTONOMOUS STUDENT GROWTH

7. Identifying Inquiry Operations, Subject of Operations
8. Identifying Inquiry Products: Data and Theories
9. Probe for Specificity
10. Teacher Probe for Data
11. Teacher Probe for Operations
12. Operation Clue Giving
13. Instructing

TUNING IN TO STUDENT FEELINGS, ATTITUDES, PERCEPTIONS

14. Probe for Theory, Status of a Theory, Inference
15. Probe for Intent of Operation, Intent of Subject of Operation
16. Probe for Prediction, Explanation
17. Giving Data, Theories
18. Data Clue Giving

When learning and practicing these Moves, you are primarily concerned with knowing the nonobservable inner state of the student. Notice the teacher's main intent is to find out about the student by his verbalizing or expressing the unobservable.

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*Strasser, Ben B. Components of a Teaching Strategy: Tactical Moves in Inquiry, Unit I. San Anselmo, California: Search Models Unlimited, 1967, pages 9-21.

Tuning In

Handout 15.2

The concern here is with learning and practicing the moves having to do with TUNING IN TO STUDENT FEELINGS, ATTITUDES, PERCEPTIONS. On the following pages each move is described four ways, Teacher INTENT, Teacher ACTION, Student ACTION, and Student EFFECT. As you examine the moves and prepare to practice them, consider the four descriptions in the following manner.

Teacher INTENT:	An unobservable purpose you want to fulfill
Teacher ACTION:	Something observable you do to fulfill your intent
Student ACTION:	Something observable you expect the student to do in response to your action
Student EFFECT:	Some unobservable inner state of the student that you hope to be the result of your action

On each of the following pages, begin by reading the intent of the move in the left column. In some cases, a move will have more than one intent. Then become familiar with the teacher actions that are consistent with the identified intent. The teacher actions are those things the teacher says or does that are intended to bring about a desired response from students. The actions identified in the second column are those which have been found particularly useful to fulfill the stated intent. Refer then to the third and fourth columns which identify the anticipated and desired student responses. In this exercise it is important that you recognize the intent of each move and the possible actions which can be taken to fulfull each.

PROBE FOR THEORY, STATUS OF A THEORY, INFERENCE

Handout 15.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Discover how the student perceives his theory and the process used in developing it	1) Asks if anyone has a different theory 2) Asks a student what he is going to do with his theory (knowing the student has generated data in conflict with the theory) 3) Asks a student what his theory looks like at the present time (knowing the student has generated data to support the theory) 4) Asks, "What do you infer about that variable?" after student has gone through a sequence of data generating operations dealing with a variable	1) Shares a theory that hasn't been mentioned 2) Says his theory is weak because of new data 3) Says his theory is strengthened because of new data 4) Says he is working on a new theory 5) Shares an inference that "agrees" with data he has generated 6) Says he wants to withhold judgment at the time 7) Identifies the data he has used to build his present theory	1) Willing to discard or modify a theory in light of new data 2) Aware of where he is with his idea 3) Willing to share with others what he is doing 4) Values talking about what he is doing because it clarifies his own thoughts and actions

PROBE FOR INTENT OF OPERATION, INTENT OF SUBJECT OF OPERATION

Handout 15.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Find out why a student is using an operation or why he used an operation, or discover why the student is using or has used something specifically as the subject of the operation	1) Asks a student why he is using an operation 2) Asks a student why he used an operation 3) Asks, "Do you have something in mind by using that operation?" 4) Asks, "Are you using that operation to develop your idea or to test it?" 5) Asks a student why he has selected what he has for the subject of his operation 6) Asks the student why he used what he did for the subject of his operation	1) States why he is using an operation 2) States why using certain operations are useful to him 3) States the limitations of using some operations in some situations 4) Says he doesn't know why he is doing something 5) Says he is just messing around 6) Says he is going to use an operation for a specific reason, uses it and gets what he is after 7) States the intent of an operation before he uses the operation 8) Student identifies the subject of the operation he is using	1) Aware of how he can use specific operations 2) Values his ability to use specific operations to generate specific data 3) Aware of how he can link operations to proceed systematically on a problem, controlling the selection of the subject of the operation

PROBE FOR PREDICTION, EXPLANATION

Handout 15.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Find out how the student perceives the powers or limitations of his theory	1) Asks, after understanding of student's theory, "How would your theory explain. . .?" and gives a situation or event for application of theory 2) Asks, after understanding a student's theory, "What would you predict would happen if. . .?" and provides event for application of theory 3) Asks, in response to a theory about the pulse glass, "Does your theory explain why the liquid moves or does it explain why they use a specific liquid in the glass?"	1) States that his theory in its present form can't explain the new situation 2) States that his theory can explain the new situation and tells how 3) Makes an accurate prediction with his theory 4) Identifies what his theory explains and what it doesn't	1) Willing to evaluate his theory in public 2) Feels free to look at his theory quite apart from himself and evaluate it on the basis of evidence
Intention II: Find out if students will continue to inquire in face of new problems	1) Deliberately asks a student to use his theory to predict a situation when he knows the theory won't work 2) Deliberately asks a student to use his theory to explain a situation when he knows it can't	1) States a theory on the new problem 2) Uses a data generating operation on the new problem 3) Asks for conference and discusses new problem with peers	1) Values using the process over just reaching conclusions. 2) Aware that there is always another question to be raised, other data to be generated

GIVING DATA, THEORIES

Handout 15.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Find out what a student will do when given data or a theory that he hasn't requested	1) Says, "Let me give you some data," and gives it knowing the data will weaken the student's theory because the theory is based on assumptions that were never verified 2) Says, "What do you think about this theory," and gives a theory different from any previously mentioned	1) Says, "Really!" and then performs data generating operation 2) Says the data he has doesn't support the theory given by the teacher 3) Says the data he has does support the theory given by the teacher	1) Aware that he needs to check out assumptions 2) Confidence in his own ability to judge ideas 3) Aware the theories are judged by evidence, not by the people giving them
Intention II: Eliminate the chance for a guessing game	1) Gives the data, knowing the students are trying to identify some data and sensing they are having difficulty getting it	1) Says, "OK," and goes on to generate more data or share an idea	1) Appreciates receiving data 2) Excited about going on with his idea

DATA CLUE GIVING

Handout 15.2

INTENT	T ACTION	S ACTION	EFFECT
Purpose teacher has in mind	Observable teacher behavior to fulfill intent	Anticipated, observable response to teacher's action	Anticipated inner state of student in response to teacher's action
Intention I: Have a student get started on an idea and strongly influence his actions to do so	1) Says, "You may want to know if the liquid is water," after asking a student what he would need to know about a problem in order to build a theory and having the student indicate that he doesn't know 2) Says, "You may want to find out if the liquid really did move," after asking a student what he would need to know about a problem in order to build a theory and having the student indicate that he doesn't know 3) Gives the student data or suggests data after the child has indicated he doesn't know what data he needs.	1) Asks, "Was it?" or "Could it?" or "Did it?" in response to teacher's data clue	1) Aware that he can deal with some parts of the problem 2) Aware that he can take some steps on his own 3) Aware that "By gosh, I do know something about the problem."

OBSERVABLE STUDENT ACTIONS INDICATING AWARENESS

Handout 15.2

This page contains a summary of the student actions taken from the student action columns on the preceding pages. They are the behaviors which the leader can theoretically expect when he uses the tuning in moves. These behaviors define the inquiring student at the level where he values and is aware of the inquiry process.

1. Performs an experiment verbally that could only be duplicated in the finest clinical settings
2. Says, "I need some information," and then uses a data generating operation to get the information he names
3. States a specific time or object he has in mind when using an experiment operation
4. Says he has already tested his theory and says how he did it and is sound in his test
5. Says, "I'm thinking that so and so is the case," and then performs data generating operation to confirm it
6. A student, other than the one the teacher is instructing gives an example
7. Says his theory is weak because of new data
8. Says his theory is strengthened because of new data
9. Says he is working on a new theory
10. Identifies the data he has used to build his present theory
11. States why he is using an operation or why he is using something as the subject of his operation
12. States why using certain operations or subjects of operations are useful to him
13. States the limitations of using some operations or subjects of operations in certain situations
14. Says he is going to use an operation or subject of an operation for a specific reason, uses it and gets what he is after
15. States the intent of an operation before he uses it
16. States that his theory in its present form can't explain a newly identified situation
17. States that his theory can explain a new situation and tells how

18. Identifies what his theory explains and what it doesn't

19. Says that the data he has doesn't support the theory given by the teacher

20. Says that the data he has does support the theory given by the teacher

TUNING IN: RATIONALE OF TEACHER TACTICAL MOVES

Handout 15.2

This information has been included to answer the question:

"Why should the teacher use the tuning in moves?"

It should establish a rationale for leader behavior where the leader is concerned with student attitudes and feelings.

Probe for Theory, Status of a Theory, Inference	The teacher is better able to direct his own effort toward allowing students to explore ways of creating ideas when he is aware of how the students perceive their ideas and the means for developing them.
Probe for Intent of Operation, Intent of Subject of Operation	The teacher is better able to direct his own effort toward helping students become more autonomous if he is aware of the values the individual has for specific actions on his part.
Probe for Prediction, Explanation	The teacher is better able to direct his own effort toward helping students examine the values of rational processes if he is aware of the existing student attitudes toward their own ideas and their processes for developing those ideas. The teacher is better able to direct his own efforts toward helping students become more "curiosity" motivated than "answer" oriented if he is aware of what students will do when presented with new problems.
Giving Data, Theories	The teacher is better able to direct his own effort toward allowing students to explore ways of creating ideas when he is aware of how the students perceive their ideas and the means for developing them. Students are more motivated to work on a personal idea when they have immediate access to information they need.
Data Clue Giving	A student, not knowing what information is important to him to get started on an idea, will be able to get started if the teacher clues him to some information that is a part of the problem.

VERIFICATION, EXPERIMENTATION, ANALOGY, NECESSITY, SYNTHESIS

SET I

1. "It moves because you have just the right amount of heat."
2. "If, instead of putting a hand on one ball, I put heat on one ball and cold on the other ball, would it go to the one that is colder?"
3. "When you put your hand on the ball does the red liquid heat up a little to give off a gas which forces the ball to fill up with gas, forcing the liquid into the other ball?"
4. "Is that a chemical in there?"
5. "Is that sulfuric acid in there?"

SET II

6. "It's the heat that makes it move, the heat from your hand."
7. "The pulse glass is like a heart pushing blood."
8. "Doesn't it move because the heat of your hand makes the red liquid vaporize so that it pushes out, and the vapor builds up until it can't go out anymore because of the pressure, so it pushes the liquid over?"
9. "If you did what you did the first time to make the liquid move, but when it starts moving, if you were to grab the tube between the two balls, would the liquid stop moving?"
10. "Does the thing work by the heat of your hand?"

SET III

11. "If your hand had no heat at all and you put it on one of the bulbs, would it work the same way?"
12. "If I put the glass in a refrigerator would the red liquid freeze?"
13. "Air makes it move like that."
14. "If you did the same thing in a room that was 30 degrees hotter, would it still work the same way?"
15. "The liquid moves because the heat repels it, pushes it away."

ANSWER SHEET:
POSSIBLE TUNING IN MOVES

Possible Teacher Actions for Tuning In To Student Perceptions, Attitudes

1. "Using your theory, what would you predict would happen if you used more heat?" (PROBE FOR PREDICTION)

   "How does your theory explain the fact that it doesn't work as quickly upside down?" (PROBE FOR EXPLANATION)

   "Let me give you a datum. It will work with less heat." (GIVING DATA)

2. NOTE: As with all generating data actions, the teacher would always give the data or make it available first.

   "What theory are you working on?" (PROBE FOR THEORY)

   "What are you trying to find out when you experiment the way you did?" (PROBE FOR INTENT OF OPERATION)

   "Why did you select heat as the subject of your experiment?" (PROBE FOR INTENT OF SUBJECT OF OPERATION)

   "What conclusions did you draw from the data you just got?" (PROBE FOR INFERENCE)

3. NOTE: Teacher would use a structuring, identifying inquiry products or probe for data move. Teacher probably wouldn't use a tuning in move here. Student is still asking for confirmation of his idea or he doesn't know that he is working with an idea. In either case it would do little good to try and find out how he perceives the process when there is evidence that he doesn't know what the process is.

Possible Teacher Actions for Tuning In To Student Perceptions, Attitudes

4. NOTE: As with all generating data operations, the teacher would always give the data or make it available first.

   "What theory are you working on?" (PROBE FOR THEORY)

   "How is it helpful to find out if there is a chemical in there?" (PROBE FOR INTENT OF OPERATION)

   "Why did you want to verify the object in the pulse glass?" (PROBE FOR INTENT OF SUBJECT OF OPERATION)

   "The liquid in there is methylene chloride." (GIVING DATA)

5. NOTE: As with all generating data operations, the teacher would always give the data or make it available first.

   "What idea are you working on?" (PROBE FOR THEORY)

   "How is it helpful to find out what's in there?" (PROBE FOR INTENT OF OPERATION)

   "Why do you want to know the name of the object in the pulse glass?" (PROBE FOR INTENT OF SUBJECT OF OPERATION)

   "It's methylene chloride." (GIVING DATA)

   NOTE: Giving the name of the liquid eliminates guessing and gives the student the data he needs--the name of the liquid.

6. "Using your theory, then, what do you predict would happen if I held the pulse glass under the cold water faucet?" (PROBE FOR PREDICTION)

   "How does your theory explain what would happen if you put the pulse glass under a water faucet?" (PROBE FOR EXPLANATION)

   "Let me give you a datum. The liquid will move without anyone even holding it." (GIVING DATA)

Possible Teacher Actions for Tuning In To Student Perceptions, Attitudes

7. NOTE: Teacher would use an allowing inquiry or facilitating growth move here. Teacher probably wouldn't use a tuning in move because analogy statements indicate the student isn't too aware of the process. Therefore, to see how he perceives the process would probably be of little value.

8. NOTE: Teacher would use a structuring, identifying inquiry products or probe for data move. Teacher probably wouldn't use a tuning in move. Student is still asking for confirmation of his idea or he doesn't know that he is working with an idea. In either case it would do little good to try and find out how he perceives the process when there is evidence that he doesn't know what the process is.

9. NOTE: As with all generating data actions, the teacher would always give the data or make it available first.

   "What idea are you working on there?" (PROBE FOR THEORY)

   "What do you infer from the data you just got?" (PROBE FOR INFERENCE)

   "Why do you find it useful to experiment the way you just did?" (PROBE FOR INTENT OF OPERATION)

   "Why did you choose to experiment by creating a new event?" (PROBE FOR INTENT OF SUBJECT OF OPERATION)

10. NOTE: Teacher would use a structuring identifying inquiry products or probe for data move. Teacher probably wouldn't use a tuning in move. Student is still asking for confirmation of his idea or he doesn't know that he is working with an idea. In either case it would do little good to try and find out how he perceives the process when there is evidence that he doesn't know what the process is.

Possible Teacher Actions for Tuning In To Student Perceptions, Attitudes

11. NOTE: As with all generating data actions, the teacher would always give the data or make it available first.

"What theory are you working on?" (PROBE FOR THEORY)

"What conclusions do you draw from that data?" (PROBE FOR INFERENCE)

"What were you trying to get from that experiment operation?" (PROBE FOR INTENT OF OPERATION)

"Why did you choose to experiment with the condition of the hand?" (PROBE FOR INTENT OF SUBJECT OF OPERATION)

12. NOTE: As with all generating data actions, the teacher would always give the data or make it available first.

"What theory are you working on?" (PROBE FOR THEORY)

"What do you infer from the datum you just got?" (PROBE FOR INFERENCE)

"What were you trying to find out?" (PROBE FOR INTENT OF OPERATION)

"Why did you choose to verify the properties of the liquid?" (PROBE FOR INTENT OF SUBJECT OF OPERATION)

13. "Using your theory, what would you predict would happen if you used it in a room where there was no air?" (PROBE FOR PREDICTION)

"How does your theory explain why it bubbled like it did?" (PROBE FOR EXPLANATION)

"Let me give you a datum. It would work the same way in a vacuum." (GIVING DATA)

Possible Teacher Actions for Tuning In To Student Perceptions, Attitudes

14. NOTE: As with all generating data actions, the teacher would always give the data or make it available first.

"What idea are you working on?" (PROBE FOR THEORY)

"What conclusions do you draw from the data you just received?" (PROBE FOR INFERENCE)

"What are you trying to find out with your experiment?" (PROBE FOR INTENT OF OPERATION)

"Why did you choose to experiment with the conditions of the room?" (PROBE FOR INTENT OF SUBJECT OF OPERATION)

15. "Using your theory, what would you predict would happen if we put something cold on one of the balls?" (PROBE FOR PREDICTION)

"How does your theory explain why it will work upside down?" (PROBE FOR EXPLANATION)

"Let me give you some data. If we put something cold on one of the balls, the liquid would move toward the cold side." (GIVING DATA)

ANSWER SHEET: POSSIBLE FACILITATING GROWTH AND ALLOWING INQUIRY MOVES

Possible Teacher Actions to Facilitate Autonomous Student Growth

1. "You have a theory that explains why the liquid moves." (IDENTIFYING INQUIRY PRODUCTS, THEORY)

   NOTE: This is the only move you would use unless you have information that the student hasn't generated any data to build or test his idea. If, over a period of time, you find the student not generating data, you might respond:

   > "What would you need to know in order for you to feel certain that's why it moves?" (TEACHER PROBE FOR DATA)

   If the student knows the information he needs, but over a period of time hasn't taken the action to get it, you might respond:

   > "What could you do to test your idea about just the right amount of heat?" (PROBE FOR OPERATIONS)

   If the student indicates he knows the information he needs but still doesn't know how to get it, you might respond:

   > "You could experiment with a different temperature to test your idea." (OPERATION CLUE GIVING)

   If the student knows the data generating action he could take to get the information he needs but still doesn't know specifically how to proceed, you might respond:

   > "To test your idea you could place a candle under one end of the pulse glass." (INSTRUCTING)

Possible Teacher Actions to Allow Inquiry

"OK, I understand your idea." (ACCEPTING)

"What do you mean by 'just the right amount of heat?'" (CLARIFYING)

Answer Sheet: Possible Facilitating Growth and Allowing Inquiry Moves

Handout 15.5

	Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
2.	"You just did an experiment by changing the object used in the original event." (IDENTIFYING INQUIRY OPERATIONS) "Experimenting is one way of producing a datum." (IDENTIFYING INQUIRY PRODUCTS, DATA) NOTE: The teacher would want to provide the datum first. (RESPONDING TO DATA PROBE AND THEN IDENTIFY THE INQUIRY OPERATION OR INQUIRY PRODUCT)	"Yes." (RESPONDING TO DATA PROBE)
3.	"You are working on a theory that explains why the liquid moves." (IDENTIFYING INQUIRY PRODUCTS, THEORY) "What would you need to know to decide if that's why it works?" (TEACHER PROBE FOR DATA) NOTE: This move seems in order because the student has asked for confirmation of his theory indicating that he can't decide on his own. NOTE: If they know the student, over a period of time, can't proceed on his own, teachers can use any of the other moves found under Item No. 1.	"Well, you'll have to decide if that's why the liquid moves. It's not my role to say if that idea is right or wrong." (STRUCTURING)
4.	"You just confirmed what the object is in the pulse glass." (IDENTIFYING INQUIRY OPERATIONS) "Confirming or verifying is one way of generating data." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"Yes." (RESPONDING TO DATA PROBE) "What do you mean by chemical?" (CLARIFICATION)

Answer Sheet: Possible Facilitating Growth and Allowing Inquiry Moves

Handout 15.5

	Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
5.	"You just verified the kind of liquid that isn't in the pulse glass." (IDENTIFYING INQUIRY OPERATIONS) "Verifying different parts of the event is one way you can get information." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"No." (RESPONDING TO DATA PROBE)
6.	"You're sharing a theory, your own idea, about why the liquid moves. (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: The teacher can use any of the other moves found under the answer to the Item No. 1 if he knows the student, over a period of time, can't proceed on his own.	"OK." (ACCEPTING)
7.	"You have a theory, an idea that explains the working of the pulse glass." (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: The teacher can use any of the other moves found under the answer to Item No. 1, if he knows the student, over a period of time, can't proceed on his own.	"OK." (ACCEPTING) "How do you mean, 'like a heart pushing blood?'" (CLARIFYING)
8.	"You're working on a theory." (IDENTIFYING INQUIRY PRODUCTS, THEORY) "What would you need to know to decide for yourself that's what makes it move?" (TEACHER PROBE FOR DATA)	"You are going to have to decide if that makes sense." "It isn't my job to say if an idea is good or bad." (STRUCTURING)

NOTE: Here, because the student is asking a question, there is some indication that he doesn't know how to decide on his own. Thus, the above move would seem to be appropriate. Any of the other moves found under the answer to Item No. 1 can also be used if the teacher has additional data that the student can't proceed on his own.

Answer Sheet: Possible Facilitating Growth and Allowing Inquiry Moves

Handout 15.5

	Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
9.	"You just experimented by changing the place where the pulse glass was held in the original event." (IDENTIFYING INQUIRY OPERATIONS) "You just got a datum through that experiment." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"No." (RESPONDING TO DATA PROBE)
10.	"You have a theory there." (IDENTIFYING INQUIRY PRODUCTS, THEORY) "What would you need to know to decide if that's how it works?" (TEACHER PROBE FOR DATA) NOTE: Here, because the student is asking a question, there is some indication that he doesn't know how to decide on his own. Thus, the above move would seem to be appropriate. Any of the other moves found under the answer to Item No. 1 can also be used if the teacher has additional data that over a period of time the student can't proceed on his own.	"It's your job to decide why it works that way." (STRUCTURING)
11.	"You have just done an experiment by changing the original condition of the hand." (IDENTIFYING INQUIRY OPERATIONS) "You got some information by experimenting." (IDENTIFYING INQUIRY PRODUCTS, DATA)	"No." (RESPONDING TO DATA PROBE)
12.	"You just verified the properties of the liquid." (IDENTIFYING INQUIRY OPERATION AND SUBJECT OF THE OPERATION) "Tell me more about the temperature of the refrigerator." (PROBE FOR SPECIFICITY)	"No." (RESPONDING TO DATA PROBE)

Answer Sheet: Possible Facilitating Growth and Allowing Inquiry Moves

Handout 15.5

	Possible Teacher Actions to Facilitate Autonomous Student Growth	Possible Teacher Actions to Allow Inquiry
12.	(Continued) NOTE: It would be difficult to provide data for this verification operation without knowing the temperature of the refrigerator. "Taking action to verify gives you information about the properties of liquids." (IDENTIFYING PRODUCTS OF INQUIRY, DATA)	
13.	"You're stating a theory." (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: Teacher can use any of the other moves found under Answer No. 1, _if_ he has the data that the student can't proceed on his own.	"OK, I understand your idea." (ACCEPTING)
14.	"You just experimented by changing the condition of the room from what it was in the original event." (IDENTIFYING INQUIRY OPERATIONS AND SUBJECT OF OPERATION) "By experimenting, you can get certain kinds of data." (IDENTIFYING INQUIRY PRODUCTS, DATA) NOTE: As with all data generating actions, the teacher would respond to the data probe and then use one of the above moves if deemed important.	"No, probably not the same way." (RESPONDING TO DATA PROBE)
15.	"You have a theory." (IDENTIFYING INQUIRY PRODUCTS, THEORY) NOTE: The teacher can use any of the moves found under the answer to Item No. 1, _if_ he has data that over a period of time the student can't proceed on his own.	"OK." (ACCEPTING)

Name__________________________________ Date______________________________

For each of the inquirer actions below, write:

A. How you would respond to the student.

B. What action the student is taking.

C. Why you responded the way you did.

1. Does the red stuff in the tube move because of light?

A.

B.

C.

2. I think that red stuff in there is like carbonated water. When you shook the glass, the liquid let off a gas, like when you shake a pop bottle. The gas makes pressure and pushes the liquid over.

A.

B.

C.

3. If the liquid was, oh, like 20 degrees hotter, would it still work?

A.

B.

C.

4. I'm not sure, but I think heat makes it move, but I need to know if you put something cold on it, that wasn't warm at all, would it still work?

A.

B.

C.

5. Could a fly live in the top of one of those little balls?

   A.

   B.

   C.

6. Why does it bubble like that?

   A.

   B.

   C.

7. Well, liquid boils at different degrees.

   A.

   B.

   C.

8. If I wanted to know if cold would make it go, we could do the experiment by putting ice on it, to see if it would move...work.

   A.

   B.

   C.

9. Well, were those bubbles, when you held it up, when it went to the arch, were those air bubbles, when it went up to the other red, to the gas...glass ball?

   A.

   B.

   C.

10. It kind of looks like a thermometer.

   A.

   B.

   C.

11. Well, for a while there, I thought it worked because of heat. Now I'm not sure because it also moves when something cold is on there.

    A.

    B.

    C.

SUBSET 16
USING TUNING IN MOVES

124 Minutes

NOTES TO LEADERS

Some participants have indicated they get tired during this subset. Take a break after the third enactment.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 16
2. Tape recorder ready with TAPE C-IV
3. Diving dropper equipment available
4. Inquirer letters available
5. Arrangements completed for participants to work with students
6. PARTICIPANT MATERIALS

    16.1 Observer Guide: Inquirer Actions
    16.2 Observer Guide: Teacher Moves
    16.3 Producer's Time Interval Sheet

SUBSET 16

	RATIONALE	MINUTES		SCHEDULE
a)	The use of tuning in moves requires the teacher to diagnose which pupils are aware of the process and the inquirer actions. The participant using his own problem focus can have a safe try at beginning to use these moves on pupils who are aware of the process but who are not sharing their perceptions and attitudes of it. He needs a safe try before practicing in the classroom.	3	a)	Introduce Subset 16. Show SCHEDULE OF ACTIVITIES.
b)	Participants can use observation guides to begin diagnosing the degree to which students show perceptions and attitudes of the process and the degree to which the teacher intervenes to get at these perceptions and attitudes. Participants will be able to tell when the teacher uses a tuning in move on a student who is not aware of the process. (Students who are aware of the process will refer to the process in response to the tuning in move.)	6	b)	Refer to HANDOUTS 16.1 and 16.2.
c)		5	c)	Give directions for listening to the first four minutes of TAPE C-IV and practice tallying inquirer actions on Handout 16.1.

LEADER INPUT

a) For this exercise you will be:

1. Learning to use guide sheets to observe inquirers sharing perceptions and attitudes of inquiry processes and teachers using tuning in moves
2. Presenting a problem focus to the small group for inquiry and trying to use some of the tuning in moves
3. Using the guide sheets to report on inquirer actions and teacher moves

The objectives are for observers to report inquirer actions as accurately as possible and for the teacher to try using tuning in moves where he has evidence that inquirers are aware of inquiry processes. The use of the tuning in moves depends upon the degree to which pupils are aware of the inquiry processes. They must be aware of the processes before they can judge or value them.

b) The guides you will be using are HANDOUTS 16.1 and 16.2. Handout 16.1 contains inquirer actions that reveal attitudes toward inquiry processes as well as actions which reveal awareness and no awareness behavior. Handout 16.2 contains tuning in moves as well as facilitating growth and allowing inquiry moves. Take 6 minutes to preview these guides. (Time 6 minutes)

c) To give you practice in using these guides, you will tally while listening to TAPE C-IV. I will play the first 4 minutes of the tape and you will tally only inquirer actions using Handout 16.1. Since it is difficult to identify individual inquirers on the tape, place all of your tallies in the Inquirer A column.

[Play first 4 minutes of Tape C-IV, stopping where Ben is saying, "Yes, you could make it work with a test tube."]

On the first part of the tape, inquirer actions are almost equally divided between awareness actions and actions without awareness. There were no inquirer actions where students reveal their attitudes toward inquiry processes.

SUBSET 16

RATIONALE	MINUTES	SCHEDULE
d)	6	d) Give directions for listening to remainder of Tape C-IV and tallying teacher moves using Handout 16.2.
e)	3	e) Explain leader, observer tasks in small groups, rotation of roles and way observers report.
f)	4	f) Ask small groups to get set up, get recorders ready and have letters on inquirers.
g) The enactment provides the teacher with the choice to use the tuning in moves in terms of the actual behavior of inquirers which he has observed during the workshop.	7	g) Start first round.

LEADER INPUT

d) For the remainder of the tape, tally only teacher moves using Handout 16.2.

[Play remainder of Tape C-IV, approximately 5 minutes.]

In the second part of the tape, the teacher chooses to use some tuning in moves because some of the inquirers are aware of the inquiry processes. Therefore, they can begin to assess the worth. The teacher used primarily Allowing Inquiry Moves, two facilitating growth moves, two Probe for Theory Moves and one Probe for Prediction.

e) You will be working in small groups just as you did when you practiced the other problem focuses. One member of the group will have the role of leader. Two members of the group will be observers. Remaining members will be inquirers and wear their letters. Observers will use Handouts 16.1 and 16.2. For each round there will be 7 minutes of inquiry and 8 minutes to report. Observers should report in the following manner:

1. The observer using Handout 16.1 will report first, indicating the kinds of actions inquirers are taking.
2. The observer using Handout 16.2 then will report indicating the kinds of teacher moves used in responding to the individual inquirers.

This data will allow the leader to assess the degree to which inquirers are sharing their perceptions and attitudes of inquiry processes and the degree to which he is using tuning in moves. It will also give him an idea of his use of tuning in moves with students who evidence awareness of inquiry processes.

If an observer is not sure that he has correctly tallied a behavior, he should identify it by inquirer and find it on the tape. In this way the entire group can help to identify the behavior during the report period.

f) Get into your small groups and get ready for the first round. After the third round we will have a short break. (Time 4 minutes)

g) Please start the first round. (Time 7 minutes)

RATIONALE	MINUTES	SCHEDULE
h)	8	h) Stop inquiry in first round and ask observers to report.
i)	80	i) Stop observer reports and start second round. Continue to start and stop small groups for each round and observer's report. (Seven minutes inquiry, eight minutes reporting) Have break after third round.
j)	2	j) Give directions for participants to make practice tape. Have droppers and rubber sheeting available. Refer to HANDOUT 16.3.

LEADER INPUT

h) Stop. Observers, please report. (Time 8 minutes)

i) Please start the second round. [Continue starting and stopping the groups for each round and the observer's report. After the third round have a short break.] (Time 80 minutes)

j) Your next task will be to make your third practice tape working with students. The tape need be only 15 minutes. You will be practicing using tuning in moves, as well as the other moves. You may use the Diving Dropper problem or you may use one of the problem focuses you have developed here in the workshop. You will be bringing the tape you produce back for the next workshop activity. Members of your trio will listen to your tape with you, using observer guides similar to the ones just used. You will have a chance to say why you used certain moves with individual students. In order for observers to identify the portions of the tape for which they are tallying, after making your tape, listen to it and complete Producer Time Interval Sheet, HANDOUT 16.3. Have your tape and time interval sheet ready for the next activity.

YOU WILL NEED YOUR FOURTH PROBLEM FOCUS FOR USE AFTER THE NEXT EXERCISE.

OBSERVER GUIDE: Handout 16.1
Inquirer Actions

Directions

1. Read down the left column to become familiar with the inquirer action items.
2. Observe the action of the student and judge it to be:
   a. Reflecting attitudes and perceptions of inquiry processes (Items 1-5)*
   b. Evidencing awareness of inquiry processes (Item 6)
   c. Taking action without awareness (Item 7)
   d. Other (Item 8)
3. Tally in the proper column opposite the item which describes the inquirer action.
4. Proper tallying is important because:
   a. Inquirer action tallies will be compared with teacher move tallies
   b. Leaders will need to be aware of inquirer actions and his moves
5. Consider correlation of problem focus with established criteria:

   Does the problem focus meet the established criteria?

   Yes _____

   No _____ Identify the areas where the problem focus does not meet the established criteria.

---

*Items 1-5 on Handout 16.1 are descriptions of student behavior which reflect an attitude or indicate how the student perceives inquiry processes. The student must be doing or saying those things described in items 1-5 before the student action can be tallied as reflecting attitudes and perceptions of inquiry processes.

OBSERVER GUIDE:
Inquirer Actions

Handout 16.1

		INQUIRER A	INQUIRER B	INQUIRER C	INQUIRER D
Feelings and Attitudes	1. TALKS ABOUT STATUS OF HIS THEORY OR ABOUT THE DATA HE IS USING Student makes comment about the strengths, weaknesses, tentativeness of his theories of about the data being used.				
	2. TALKS ABOUT USEFUL WAYS OF GENERATING DATA Student makes comment about which data generating action or subjects of actions seem useful.				
	3. APPLIES A THEORY OR USES A THEORY TO PREDICT Student tries applying a theory to new events or uses a theory to predict.				
	4. CONTINUES TO INQUIRE IN FACE OF NEW PROBLEM Student takes action on a new problem which arises because a theory can't account for some event or situation.				
	5. USES DATA THEORY MATCH AS BASIS FOR JUDGING Student says that he accepts or rejects a datum or a theory because it does or doesn't match with other data.				
Aware	6. INQUIRER ACTIONS INDICATING AWARENESS Aware of products and operations Aware of data needed and operations Precise data probes Aware of how to begin and test ideas				
Unaware	7. INQUIRER ACTIONS WITHOUT AWARENESS Expressing Idea Generating Data Problem Focus Question Theoretical Data Statement				
Other	8. OTHER STUDENT ACTIONS				
	9. TALK NOT CLEAR				

OBSERVER GUIDE:
Teacher Moves

Directions

1. Read down the left column to become familiar with the teacher moves.

2. Observe the move of the teacher and judge it to be:

   a. Tuning in to inquirer perceptions and attitudes (Items 1-5)

   b. Facilitating growth (Item 6)

   c. Allowing inquiry (Item 7)

   d. Other (Item 8)

3. Note the inquirer to whom the teacher is responding and tally in the proper column opposite the item which describes the teacher move.

4. Proper tallying is important because:

   a. Teacher moves will be compared with inquirer actions

   b. Teacher needs to be aware of how he is responding to inquirer actions

5. Consider correlation of the problem focus with established criteria:

   Does the problem focus meet the established criteria?

   Yes _____

   No _____ Identify the areas where the problem focus does not meet the established criteria.

OBSERVER GUIDE:
Teacher Moves

Handout 16.2

		INQUIRER A	INQUIRER B	INQUIRER C	INQUIRER D
Tuning In	1. PROBE FOR THEORY, STATUS OF A THEORY, INFERENCE Teacher asks a student to identify his theory, identify how his theory seems to him, or make an inference from data he just generated.				
	2. PROBE FOR INTENT OF OPERATION, INTENT OF SUBJECT OF OPERATION Teacher asks a student why he used or is going to use a specific operation or why he used or is going to use something specifically as the subject of an operation.				
	3. PROBE FOR PREDICTION, EXPLANATION Teacher asks a student to use his theory to predict or explain a given situation or event.				
	4. GIVING DATA, THEORIES Teacher offers student a theory or a datum not asked for.				
	5. DATA CLUE GIVING Teacher suggests to a student a particular datum that he might want to obtain.				
Facilitating	6. FACILITATING GROWTH MOVES Identifying Inquiry Operation Identifying Inquiry Products Probe for Specificity Teacher Probe for Data Probe for Operation Operation Clue Giving Instructing				
Allowing Inquiry	7. ALLOWING INQUIRY MOVES Focus Setting Structuring Clarifying Accepting Responding to Data Probe Teacher Silence				
Other	8. OTHER TEACHER RESPONSES				
	9. TALK NOT CLEAR				

PRODUCER'S TIME INTERVAL SHEET **Handout 16.3**

Producer's Name____________________________ Date______________________

If the procedure for completing this form is unclear, review page 215, Handout 9.3.

Time Period (Two minutes each)	Period Boundaries
1	Period begins with: Period ends with:
2	Period begins with: Period ends with:
3.	Period begins with: Period ends with:
4.	Period begins with: Period ends with:
5.	Period begins with: Period ends with:

SUBSET 17
ASSESSING THIRD PRACTICE TAPE

105 Minutes

NOTES TO LEADERS

Participants have only one way of judging if they are able to identify inquirer or leader behavior correctly. They must use the definitions on the guide sheets and have group members analyze the behavior in question. It is important that they do this during Activities (d) through (i) while the listeners are reporting.

LEADER PREPARATION

1. Newsprint or overhead transparency of schedule of activities for Subset 17

2. Arrangements completed for participants to work with students

3. PARTICIPANT MATERIALS

    17.1 Listener Guide: Inquirer Actions
    17.2 Listener Guide: Teacher Moves
    17.3 Sample Guide for Fourth Practice Tape
    17.4 Self-Prepared Listening Guide (NCR PAPER)
    17.5 Producer's Time Interval Sheet

SUBSET 17

	RATIONALE	MINUTES		SCHEDULE
a)	Participants must have a chance to assess their practice efforts at using the total range of tactical moves by receiving accurate, objective reports of what took place.	3	a)	Introduce Subset 17. Show SCHEDULE OF ACTIVITIES.
b)	Participants acting as observers and using observation guides can give accurate data to the producer. The producer, in turn, can match the data reported with his own intention and determine the degree of consistency between his intent and his actions. Using two observers to record and report data will increase skill and reliability of observers.	4	b)	Refer to HANDOUTS 17.1 and 17.2. Ask participants to read directions for use and review.
c)			c)	Give directions for using guides.
d)		2	d)	Give directions for trio members playing practice tapes and for listeners reporting.

LEADER INPUT

a) For this exercise you will be:

1. Playing your practice tape in your trio
2. Using guides to assess the degree to which inquirers share perceptions and attitudes of inquiry processes and the degree to which the teacher uses tuning in moves
3. Saying why you responded the way you did to an individual inquirer

The objectives are for the listeners to provide as accurate data as possible to the producer. The producer should report on why he responded as he did to particular inquirers.

b) Listeners will be using HANDOUTS 17.1 and 17.2. The items on the guides are identical to HANDOUTS 16.1 and 16.2. However, the column headings for tallying are revised. Take four minutes to review the guides. (Time 4 minutes)

c) Notice that the listeners will be tallying by time periods. Just as you have done in the past, the producer will have his time interval sheet in front of him while the tape is playing. He will inform listeners when to begin tallying in another time period column. He will also stop the tape after each set of inquirer action and teacher moves to allow the listeners to identify the behaviors and to tally.

d) One member of the trio should volunteer to play his tape. Another member of the trio will use Handout 17.1 and the third member, Handout 17.2. After the producer has played eight minutes of his tape, I will ask listeners to report. Listeners will have eleven minutes to report in the following manner:

1. The listener using Handout 17.1 will report first, indicating the various inquirer actions
2. The listener using Handout 17.2 will then report, indicating the kinds of teacher moves used in responding to individual inquirers.

WHEN THERE ARE QUESTIONABLE BEHAVIORS, LISTENERS SHOULD IDENTIFY THEM BY TIME PERIOD. THE PRODUCER THEN CAN FIND THE BEHAVIOR ON THE TAPE AND THE TRIO CAN IDENTIFY IT.

RATIONALE	MINUTES	SCHEDULE
d)		d) Continued
	8	Trio members start first round.
e) Observers will be able to tell if the teacher is using the tactical moves indiscriminately, or if the teacher is using the moves in a diagnostic, evaluative manner.	11	e) Stop tape playing and ask listeners to report.
f)	8	f) Stop first round reporting. Ask trio members to start second round.
g)	11	g) Stop tape playing and ask second round listeners to report.
h)	8	h) Stop second round reporting. Ask trio members to start third round.
i)	11	i) Stop tape playing and ask third round listeners to report.
j)	3	j) Give directions for making fourth practice tape and completing own listener guide with HANDOUTS 17.3 and 17.4.

LEADER INPUT

d) The producer will then identify one of the two-minute time periods where he uses tuning in moves, as reported by the listeners. He will replay this portion of the tape and, after each of his responses to an inquirer, say why he responded the way he did.

Spread out so that recorders do not interfere with one another and start your first round.

[Check to see that producers are identifying time periods and stopping recorder] (Time 8 minutes)

e) Listeners, please report to the producer. Following their reports, the producer should say why he responded the way he did to inquirers from a two-minute portion of the tape. Producers try to choose a two-minute period where you used tuning in moves. (Time 11 minutes)

f) Will the second producer play his tape. (Time 8 minutes)

g) Listeners, report to the producer. Producers should say why they responded the way they did. (Time 11 minutes)

h) Will the third producer play his tape. (Time 8 minutes)

i) Listeners, report to the producer. Producers, say why you responded the way you did. (Time 11 minutes)

j) Up to now you have been concentrating on a particular set of moves for each of your practice efforts. For the fourth and final practice of the workshop, you will be using the full range of tactical moves. You will be concentrating on some particular responses that you have identified. These should be responses where you think further practice would be helpful.

SO THAT YOU CAN IDENTIFY THE PARTICULAR RESPONSES YOU WANT TO PRACTICE AND SO THAT MEMBERS OF YOUR TRIO CAN HELP YOU ASSESS YOUR PRACTICE EFFORTS, YOU WILL BE CONSTRUCTING YOUR OWN GUIDE SHEET.

HANDOUT 17.3 is a sample of such a guide sheet constructed by a previous workshop participant. Take a minute to look at this sample guide sheet. (Time 1 minute)

SUBSET 17

RATIONALE	MINUTES	SCHEDULE
k)	20	k) Give directions for participants to complete their own observer guide.
l)	16	l) Give directions for trio members checking on clarity of observer guide items.
m)		m) Give directions for completing time interval sheet.

LEADER INPUT

k) Now, use HANDOUT 17.4 to individually construct your own guide sheet. You will be making three copies, using NCR paper, so you can share your guide with trio members. Directions for constructing a guide are attached to Handout 17.4. (Time 20 minutes)

l) In your trios, share the guide sheets you just constructed and get help in making sure the behavior you want observed is clearly stated. To do this, one member of the trio should distribute his guide to the other two members. The two members should read each of the items and check with the guide sheet producer to make sure they understand the behavior to be observed. The producer then may want to revise some of his items so that they communicate clearly the behavior to be observed. The second and third members of the trio should share their guides in a like manner. You will have 15 minutes for this task. (Time 16 minutes)

m) Hold on to the three copies of your observation guides so they can be shared with the trio members when you play your fourth practice tape. So that observers can correlate their tallies with portions of the tape, listen to your fourth practice tape and complete the time interval sheet, HANDOUT 17.5.

LISTENER GUIDE: Handout 17.1

Inquirer Actions

Directions

1. Read down the left column to become familiar with the inquirer action items.

2. Observe the action of the student and judge it to be:

   a. Reflecting attitudes and perceptions of inquiry processes (Items 1-5)*

   b. Evidencing awareness of inquiry processes (Item 6)

   c. Evidencing unawareness (Item 7)

   d. Other (Item 8)

3. Tally in the proper time period opposite the item which describes the inquirer action.

4. Proper tallying is important because:

   a. Inquirer action tallies will be compared with teacher move tallies.

   b. Teacher needs to be aware of inquirer actions and tactical moves

5. Consider correlation of the problem focus with established criteria:

   Does the problem focus meet the established criteria?

   Yes______

   No ______ Identify the areas where the problem focus does not meet the established criteria.

---

*Items 1-5 on Handout 17.1 are descriptions of student behavior which reflect an attitude or indicate how the student perceives inquiry processes. The student must be doing or saying those things described in items 1-5 before the student action can be tallied as reflecting attitudes and perceptions of inquiry processes.

LISTENER GUIDE:
Inquirer Actions

Handout 17.1

		Time Period 1	Time Period 2	Time Period 3	Time Period 4	Time Period 5
Feelings and Attitudes	1. TALKS ABOUT STATUS OF HIS THEORY OR ABOUT THE DATA HE IS USING Student makes comment about the strengths, weaknesses, tentativeness of his theories or about the data being used.					
	2. TALKS ABOUT USEFUL WAYS OF GENERATING DATA Student makes comment about which data generating action or subjects of actions seem useful.					
	3. APPLIES A THEORY OR USES A THEORY TO PREDICT Student tries applying a theory to new events or uses a theory to predict.					
	4. CONTINUES TO INQUIRE IN FACE OF NEW PROBLEM Student takes action on a new problem which arises because a theory can't account for some event or situation.					
	5. USES DATA THEORY MATCH AS BASIS FOR JUDGING Student says he accepts or rejects a datum or a theory because it does or doesn't match with other data.					
Aware	6. INQUIRER ACTIONS INDICATING AWARENESS Aware of products and operations Aware of data needed and operations Precise data probes Aware of how to begin and test ideas					
Unaware	7. INQUIRER ACTIONS WITHOUT AWARENESS Expressing Idea Generating Data Problem Focus Question Theoretical Data Statement					
	8. OTHER STUDENT ACTIONS					
	9. TALK NOT CLEAR					

LISTENER GUIDE: Handout 17.2

Teacher Moves

Directions

1. Read down the left column to become familiar with the teacher tactical moves.

2. Observe the move of the teacher and judge it to be:

   a. Tuning in to inquirer perceptions and attitudes (Items 1-5)

   b. Facilitating growth (Item 6)

   c. Allowing inquiry (Item 7)

   d. Other (Item 8)

3. Tally in the proper time period opposite the item which describes the teacher move.

4. Proper tallying is important because:

   a. Teacher moves will be compared with inquirer actions

   b. Teacher needs to be aware of how he is responding to inquirer actions.

5. Consider correlation of the problem focus with established criteria:

   Does the problem focus meet the established criteria?

   Yes _____

   No _____ Identify the areas where the problem focus does not meet the established criteria.

LISTENER GUIDE:
Teacher Moves

Handout 17.2

		Time Period 1	Time Period 2	Time Period 3	Time Period 4	Time Period 5
Tuning In	1. PROBE FOR THEORY, STATUS OF A THEORY, INFERENCE Teacher asks a student to identify his theory, identify how his theory seems to him, or make an inference from data he just generated.					
	2. PROBE FOR INTENT OF OPERATION INTENT OF SUBJECT OF OPERATION Teacher asks a student why he used or is going to use a specific operation OR why he used or is going to use something specifically as the subject of an operation.					
	3. PROBE FOR PREDICTION, EXPLANATION Teacher asks a student to use his theory to predict or explain a given situation or event.					
	4. GIVING DATA, THEORIES Teacher offers student a theory or a datum.					
	5. DATA CLUE GIVING Teacher suggests to a student a particular datum that he might want to obtain.					
Facilitating Inquiry	6. FACILITATING GROWTH TACTICAL MOVES Identifying Inquiry Operations Identifying Inquiry Products Probe for Specificity Teacher Probe for Data Probe for Operation Operation Clue Giving Instructing					
Allowing Inquiry	7. ALLOWING INQUIRY TACTICAL MOVES Focus Setting Structuring Clarifying Accepting Responding to Data Probe Teacher Silence					
	8. OTHER TEACHER RESPONSES					
	9. TALK NOT CLEAR					

SAMPLE GUIDE FOR
FOURTH PRACTICE TAPE

Handout 17.3

Actions You Want to Practice	Time Period 1	Time Period 2	Time Period 3	Time Period 4	Time Period 5
1. When an inquirer asks a necessity question, I will use a probe for data move (what would you need to know)					
2. When inquirer asks for data I will provide only the information requested					
3. Will use an instructing move (give an example when the inquirer has shown he doesn't know how to get the information he says he needs)					
4. Will avoid saying "Why do you think that" or "What makes you think that".					

SELF-PREPARED LISTENING GUIDE Handout 17.4

Directions

1. After each practice session with students, your trio met to assess your efforts from the tape. During each of the assessment periods you received feedback from guide sheets and trio members. This feedback noted particular kinds of responses or tactical moves you could improve through more practice.

2. Select from one to four of the responses or tactical moves that you want to practice during your fourth practice tape.

3. Write in each of the responses or moves opposite an item number on Handout 17.4. Check to see that the three sheets of no carbon required (NCR) paper are lined up.

4. Use language that clearly describes the particular response or tactical move that you want to practice.

5. Descriptive language is necessary for observers in the trio to distinguish the response or move being practiced.

SELF-PREPARED LISTENING GUIDE Handout 17.4

Actions You Want to Practice	Time Period 1	Time Period 2	Time Period 3	Time Period 4	Time Period 5
1.					
2.					
3.					
4.					

PRODUCER'S TIME INTERVAL SHEET **Handout 17.5**

Producer's Name____________________________Date_________________________

If the procedure for completing this form is unclear, review page 215, Handout 9.3.

Time Period (Two minutes each)	Period Boundaries
1	Period begins with: Period ends with:
2	Period begins with: Period ends with:
3	Period begins with: Period ends with:
4	Period begins with: Period ends with:
5	Period begins with: Period ends with:

SUBSET 18
ASSESSING FOURTH PRACTICE TAPE

74 Minutes

NOTES TO LEADERS

Finish--hope you've enjoyed yourself.

LEADER PREPARATION

1. Newsprint or overhead transparency with schedule of activities for Subset 18

2. Check in sheet for things borrowed (if you used one)

3. PARTICIPANT MATERIALS

    18.1 Final Questionnaire

SUBSET 18

	RATIONALE	MINUTES		SCHEDULE
a)	Participants have had a chance to practice the individual sets of tactical moves. They now should be ready to use the full range of moves and continue practice on particular responses and moves which they have identified. Individual participants are able to identify particular responses and moves which they need to practice.	3	a)	Introduce Subset 18. Show SCHEDULE OF ACTIVITIES.
b)	Listeners will be able to report to the producer the effects of his practice efforts by using the guide sheet he constructed. The producer will be able to use the data reported to further diagnose his own skill attainment.	1	b)	Give directions for playing practice tape and using participant constructed guides.
c)		7	c)	Trio members start first round.
d)		8	d)	Stop tape playing and ask listeners to report.
e)		7	e)	Stop first round reporting and ask trio members to start second round.
f)		8	f)	Stop tape playing and ask second round listeners to report.
g)		7	g)	Stop second round reporting and ask trio members to start third round.
h)		8	h)	Stop tape playing and ask third round listeners to report.

LEADER INPUT

a) In this exercise you will be:

1. Playing your fourth practice tape where you used the particular responses or moves which you have identified
2. Using a guide sheet the producer has constructed to assess his practice efforts
3. Reporting to the producer the results of his practice efforts

The objective is to report to the producer as accurately as possible the degree to which he was able to fulfill his practice intent.

b) One member of the trio should volunteer to play his tape. He will distribute his guide sheets to the other two trio members. While the tape is playing he will refer to his time interval sheet to let the listeners know the time period column in which they are to tally. After 7 minutes of tape playing, the listeners will report.

Each listener will report in turn, the number of times the teacher used a response or tactical move that the tape producer was trying to practice. If the producer was looking for particular inquirer conditions to respond to which did not occur, this should be reported also. Where differences in listener tallies arise, refer back to the situation on the tape and seek to clarify the discrepancy. The time interval columns help locate the situation.

c) You can start the first round. (Time 7 minutes)

d) Stop the tape playing. Listeners, please report. (Time 8 minutes)

e) Stop reporting and start the second round. (Time 7 minutes)

f) Listeners for the second round, please report. (Time 8 minutes)

g) Listeners, stop reporting and start third round. (Time 7 minutes)

h) Listeners for the third round, please report. (Time 8 minutes)

SUBSET 18

RATIONALE	MINUTES	SCHEDULE
i)	10	i) Ask participants to complete HANDOUT 18.1.
j)	15	j) Collect all apparatus borrowed by participants.

LEADER INPUT

i) We would like your reactions to the workshop. Please complete the final questionnaire, HANDOUT 18.1. (Time 10 minutes)

j) Before leaving will you leave with me any apparatus which you may have borrowed. (Time 15 minutes)

FINAL QUESTIONNAIRE

Handout 18.1

(Workshop) (Extension Course):

Title____________________________ Name____________________________

Location__________________________ Date____________________________

1. To what extent has this workshop or course fulfilled your expectations about what you personally might get out of it?

Has not come up to my expectations	☐	☐	☐	☐	☐	☐	Has exceeded my expectations

a) What exactly has happened that brings you to this conclusion?

2. Think for a moment about the informational materials, practice exercises and methods used in this workshop or course. All in all, how would you rate them? (CHECK ONE BOX IN EACH LINE)

Only restated or proved what I already knew	☐	☐	☐	☐	☐	☐	Offered new insights, new ways of viewing old problems
Spoke to important issues, vital concerns	☐	☐	☐	☐	☐	☐	Missed the important issues, vital concerns
Hard to understand, complex, full of "jargon"	☐	☐	☐	☐	☐	☐	Clear, understandable
Ideas, skills, methods can be used immediately under existing conditions	☐	☐	☐	☐	☐	☐	Requires changes in conditions that I have no control over in order to use
Little "how to" help for my actual work in the school and/or classroom	☐	☐	☐	☐	☐	☐	Provided real "how to" help for my actual work in the school and/or classroom

3. During the workshop/course, did you try using any of the ideas or skills in your teaching?

_____Yes, regularly

_____Yes, occasionally

_____Yes, once or twice when we had assignments

_____No, not at all (Go to Question 4)

(a) How comfortable, natural to you, did it feel?

Not at all, I was and am still very uncomfortable ☐ ☐ ☐ ☐ ☐ ☐ Very comfortable natural, a whole new way of working with students

(b) Did you notice in your classroom or in particular students, any effects, positive or negative, of your using these skills or ideas?

No _____

Yes_____

Please describe any effects you noticed?

4. In all honesty, do you plan to use the ideas, skills and/or materials presented in this workshop as an integral part of your work as a teacher?

No _____ (Go to Question 5)

Yes_____

(a) Please give at least one concrete example of what you will do differently now than you would have done before attending this workshop/course.

(b) What help or resources (materials, other persons, etc.) do you feel you will need to fully implement the skills you have learned in this workshop/course?

5. Were there any points in the workshop where you had a feeling of sudden insight, of really knowing what it was all about (an "Ah-ha")?

_____No, I was always pretty clear.

_____No, I'm still in a bit of a muddle.

_____Yes. What in particular triggered the insight(s)?_______

6. Were there any points in the workshop where you had a feeling of complete confusion and/or frustration?

_____No, I felt almost no confusion or frustration.

_____No, any confusion or frustration was cleared up pretty quickly.

_____Yes. What in particular led to that feeling? __________

Has the confusion or frustration been resolved?

_____Yes, how?______________________________

_____No

7. People attend workshops and courses for a variety of reasons. Please check honestly any of the following reasons that apply to you, and CIRCLE the checkmark of the reason which was MOST IMPORTANT in your decision to attend.

_____It satisfies a requirement or gives me credits I need.

_____Many others in my school (school system) were attending.

_____My superiors suggested I go.

_____My superiors gave me the opportunity to go.

_____I was selected to attend.

_____My attendance was paid for.

_____I came because I really wanted to learn.

_____I'd heard_______________________________________

_____I had a particular problem to solve or deal with and thought this training would help me.

_____Other (Be Specific)______________________________

____

____

8. Now that the workshop/course is over, how would you sum up the experience?

Not very worthwhile ☐ ☐ ☐ ☐ ☐ ☐ Extremely worthwhile

Major factors contributing to your assessment:

APPENDIX A: Transparency Set

APPENDIX B: Learning Objectives

APPENDIX C: Typescripts of Confrontation Tapes

APPENDIX D: Workshop Designs

WORKSHOP THEMES

1. LEARNING TO USE INTERACTION PATTERNS WHICH:

   ALLOW STUDENTS TO INQUIRE
   ENABLE STUDENTS TO GROW AS INQUIRERS
   REVEAL STUDENTS' ATTITUDES AND PERCEPTIONS ABOUT INQUIRY PROCESSES

2. LEARNING WHAT STUDENTS DO WHEN THEY INQUIRE AND GROW AS INQUIRERS

3. LEARNING TO HELP ONE ANOTHER LEARN

SUBSET 2

SCHEDULE OF ACTIVITIES

1. HEAR TAPE OF STUDENTS AND TEACHER
2. INQUIRE INTO TEACHER'S BEHAVIOR
3. WRITE STATEMENT EXPLAINING TEACHER BEHAVIOR
4. CLARIFY STATEMENT IN TRIOS

SUBSET 3

SCHEDULE OF ACTIVITIES

1. READ A DEFINITION OF INQUIRY
2. IDENTIFY RISKS/ ADVANTAGES OF ALLOWING INQUIRY
3. HELP ONE ANOTHER GET A CLEAR STATEMENT

SUBSET 4

SCHEDULE OF ACTIVITIES

1. READ WHAT THE TEACHER DOES TO ALLOW INQUIRY
2. IDENTIFY TEACHER BEHAVIOR FROM TAPE C-II
3. CHECK ANSWERS OF TEACHER BEHAVIOR IDENTIFIED

SUBSET 5

SCHEDULE OF ACTIVITIES

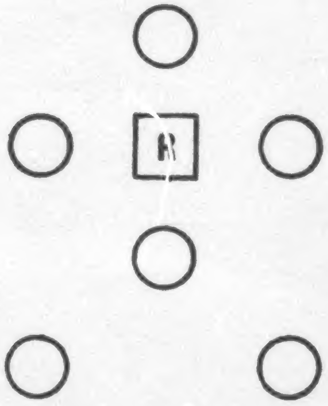
1. REVIEW DESCRIPTION OF INQUIRER ACTIONS
2. PRACTICE IDENTIFYING AND RESPONDING TO INQUIRER ACTIONS
3. COMPARE PRACTICE RESPONSES WITH ANSWER SHEET

SUBSET 6

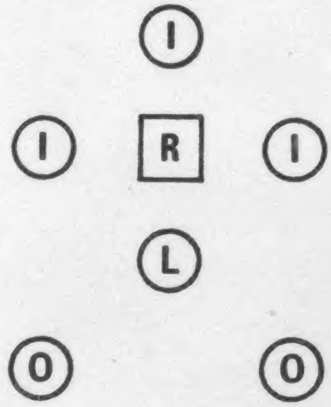
SCHEDULE OF ACTIVITIES

1. PRESENT A PROBLEM FOCUS FOR INQUIRY
2. TRY USING ONLY ALLOWING INQUIRY MOVES
3. OBSERVE AND TALLY LEADER BEHAVIOR
4. REPORT BEHAVIOR OBSERVED TO LEADER

SUBSET 6
SMALL GROUP ARRANGEMENT



CHAIRS



I = INQUIRER
R = TAPE RECORDER
L = LEADER
O = OBSERVER

SUBSET 7

SCHEDULE OF ACTIVITIES

1. LEARN ABOUT FORCE FIELD ANALYSIS TECHNIQUE
2. IDENTIFY, INDIVIDUALLY, THE FORCES OPERATING IN TRIO
3. GET HELP IN CLARIFYING FORCES
4. IDENTIFY WORKSHOP INTERFERENCES

SUBSET 7

FORCE FIELD DIAGRAM

PROBLEM: SMOKING

OPPOSITE OF GOAL: CONTINUE SMOKING

FORCES FOR GOAL →	← FORCES AGAINST GOAL

GOAL: STOP SMOKING

SUBSET 8

SCHEDULE OF ACTIVITIES

1. READ A DESCRIPTION OF A PROBLEM FOCUS
2. LEARN TO DIFFERENTIATE QUESTION TYPES
3. READ EXAMPLE OF PROBLEM FOCUSES
4. DEVELOP A PROBLEM FOCUS

SUBSET 9

SCHEDULE OF ACTIVITIES

1. PRESENT A PROBLEM FOCUS FOR GROUP INQUIRY
2. PRACTICE USING ONLY ALLOWING INQUIRY MOVES
3. CHECK TO SEE THAT MOVES ARE USED APPROPRIATELY
4. GIVE FEEDBACK ON DEGREE OF APPROPRIATE LEADER BEHAVIOR

PRODUCER'S TIME INTERVAL SHEET

Name ______________________ Date ________

Time Period*	Period Boundaries	
1	Period Begins With:	T. "why does the red liquid move ?"
	Period Ends With:	S. "Is that water in there ?"
2	Period Begins With:	T. "No it's not water."
	Period Ends With:	S. "Liquids boil at different temperatures."
3	Period Begins With:	T. "are you saying that this liquid boils at a special temperature ?"
	Period Ends With:	S. "there's a lot of pressure in the glass."

*Each time period equals two minutes.

SUBSET 10

SCHEDULE OF ACTIVITIES

1. PLAY PRACTICE TAPE IN TRIO
2. DETERMINE APPROPRIATENESS OF LEADER RESPONSE
3. REPORT TO PRODUCER ON APPROPRIATENESS OF HIS RESPONSES

SUBSET 11

SCHEDULE OF ACTIVITIES

1. RATE YOURSELF ON GROUP HELPING SKILLS
2. SHARE RATING WITH TRIO MEMBERS

SUBSET 12

SCHEDULE OF ACTIVITIES

1. HEAR TEACHER USING FACILITATING GROWTH MOVES
2. PRACTICE DIAGNOSING INQUIRER GROWTH
3. PRACTICE USING FACILITATING GROWTH MOVES

SUBSET 13

SCHEDULE OF ACTIVITIES

1. IDENTIFY INQUIRER AWARENESS BEHAVIOR
2. IDENTIFY FACILITATING GROWTH MOVES
3. TRY USING FACILITATING GROWTH MOVES

SUBSET 14

SCHEDULE OF ACTIVITIES

1. PLAY THE PRACTICE TAPES
2. TALLY AND REPORT INQUIRER AND TEACHER BEHAVIOR
3. TELL WHY YOU, AS LEADER, RESPONDED AS YOU DID

SUBSET 15

SCHEDULE OF ACTIVITIES

1. HEAR TAPE OF TEACHER USING TUNING IN MOVES
2. REVIEW INTENTIONS AND ACTIONS OF TEACHER
3. PRACTICE USING TUNING IN MOVES IN TRIO

SUBSET 16

SCHEDULE OF ACTIVITIES

1. PRACTICE USING GUIDE SHEETS
2. PRESENT PROBLEM FOCUS AND PRACTICE USING TUNING IN MOVES
3. USE GUIDE SHEET TO REPORT ON INQUIRER-TEACHER BEHAVIOR

SUBSET 17

SCHEDULE OF ACTIVITIES

1. PLAY PRACTICE TAPES
2. IDENTIFY AND TALLY INQUIRER, LEADER BEHAVIOR
3. TELL WHY YOU RESPONDED THE WAY YOU DID

SUBSET 18

SCHEDULE OF ACTIVITIES

1. PLAY PRACTICE TAPE
2. IDENTIFY TEACHER BEHAVIOR
3. COMPLETE FINAL WORKSHOP QUESTIONNAIRE

Appendix B

SUBSET REACTION SHEET

(Workshop or Extension Course)

Date________________________

Title____________________________

Name________________________

1. How productive has this session been for you personally?

Not Very Productive	☐	☐	☐	☐	☐	☐	Extremely Productive

What contributed to productivity for you?

What hindered productivity for you?

2. How clear were you about what you were supposed to be doing and why you were doing it during this session?

Very Confused	☐	☐	☐	☐	☐	☐	Very Clear

What, in particular, did you find confusing or unclear?

3. All in all, how well was your group working during this session?

We Seemed to Be Hung Up, Stymied	☐	☐	☐	☐	☐	☐	We Worked Very Smoothly, Effectively

What seemed to help your group in its work?

What seemed to hinder your group?

4. Additional comments and feedback:

LEARNING OBJECTIVES

LONG-RANGE PERSONAL BEHAVIOR

To integrate into a personal theoretical/conceptual structure the ide
process be subjected to the rational and creative processes of the in
conceptualizes new learning and human interaction phenomenon, as he i
searches out change.

POSSIBLE ENABLING BEHAVIORS

- Responds intuitively to a task presented in the workshop
- States his own theory in response to some workshop concept
- Gathers data to test his own theory related to some workshop concept
- Shares with his small group the data he has gathered
- Tries different operations to generate data
- Revises a theory in light of conflicting data
- Continues to test an idea over the workshop period, generating data and matching them with his theory
- Identifies own problem focus for professional inquiry
- Explores and uses a wide variety of data sources
- Uses (reads, consults, refers to) workshop material to solve some of his own classroom problems and as a data source in building and testing own theories concerning learning, teaching
- Uses force field technique to share perceptions of working trio effectiveness
- Identifies the generalized pattern of teacher response to student action

ideas contained in the inquiry workshop so they can be tested and tried and in the
e individual trainee. The individual will sense his cognitive power growing as he
he identifies these in operation, and as he forms theoretical constructs from which he

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LEARNING OBJECTIVES

LONG-RANGE PERSONAL BEHAVIOR

To function as a supportive member of a learning group by being willi
the processes and actions of the group; by helping the group analyze
members to facilitate their growth in workshop skills.

POSSIBLE ENABLING BEHAVIORS

- Restates what he has heard
- Asks for confirmation, illustrations, examples
- Asks for repeat of message
- Uses words and terms that are descriptive
- States the facts that underlie his assumptions
- Is direct and to the point
- Sticks to the task or topic at hand
- Checks to see what others have heard
- Reports on perceived nonverbal messages
- Maintains continuity in a discussion
- Indicates how he wants to be helped
- Tells how he has been helped and when he has been helped
- Tells when he has not been helped
- Presses for clarity and specificity
- Indicates when he is getting a clear message
- Shifts direction of the analysis process, searching for more productive ways
- Relates time when someone did something to cause another to be active
- Relates time when things caused another to withdraw
- Operates a tape recorder to get a recording that can be heard by other group members
- Uses a workshop guide to feed back group member behavior related to a specific workshop skill
- Reports to trio and/or small group members the helping and hindering group behaviors that he observes

lling to attend to, understand and help another express nimself; by being attentive to
ze the strengths and weaknesses of its actions; and by providing feedback to other group

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LEARNING OBJECTIVES

LONG-RANGE PERSONAL BEHAVIOR	To establish and maintain the classroom conditions allowing inquiry
POSSIBLE ENABLING BEHAVIORS	Names and/or lists allowing inquiry moves
	Develops a problem focus which meets the stated criteria
	Provides students with problem focuses for their inquiry
	Legitimates for inquiry the problem focuses identified by students
	Informs students of the classroom structure in which they can explore and create ideas
	Takes steps to understand a student's idea and what the student is doing or trying to do to build that idea
	Accepts and understands a student's idea without judging it
	Identifies when a student is expressing an idea and/or when he is trying to generate data to build or test an idea
	Makes available and identifies for students resources available for meeting the student's data probes
	Refrains from breaking silence when periods of silence naturally occur in the classroom
	Differentiates inferential statements and questions from descriptive statements and questions
	Finds the isolate (variable) that makes the difference in improving his own performance
	Names and/or lists specific inquirer actions
	Discriminates and classifies inquirer actions from a printed sheet
	Provides appropriate responses to inquirer actions read from a printed sheet
	Provides appropriate responses to inquirer actions during a live workshop enactment where problem focus is provided
	Provides appropriate responses to inquirer actions during a live workshop enactment where the trainer's own problem focus is used
	Discriminates and classifies inquirer actions from a live workshop enactment
	Judges if a given problem focus meets the established criteria
	Provides appropriate responses to inquirer actions when working with a group of students

uiry to happen.

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LEARNING OBJECTIVES

LONG-RANGE PERSONAL BEHAVIOR

To diagnose and evaluate where individual students would fall on a con
that his choice to proceed and how to proceed with his idea is always

POSSIBLE ENABLING BEHAVIORS

- Names and/or lists the facilitating growth moves
- Identifies for a student an operation or a subject of an operation the student has just used
- Identifies for a student a datum or a theory that a student has just generated
- Asks a student to make his data probe more specific
- Asks a student what data he needs to proceed productively with his idea (when the student isn't proceeding)
- Asks a student what operation he would use to generate the data he has identified as necessary (when the student isn't using the operation)
- Identifies for the student the operation he might use to get the datum he needs (when the student doesn't know)
- Identifies for the student the operation and the subject of the operation he might use to get the datum he needs (when the student doesn't know)
- Provides appropriate responses to inquirer actions read from a printed sheet
- Provides appropriate responses to inquirer actions during a live workshop enactment when trainee's own problem focus is used
- Identifies, while using an observation guide, facilitating growth moves used by the teacher during a live workshop enactment
- Judges, while using an observation guide and listening to a tape recording, whether the teacher has used facilitating growth moves indiscriminately or in a diagnostic manner
- Provides appropriate responses to inquirer actions during a practice session with students

continuum of student autonomous growth and to interact with the student in such a way
ways maximized and productive to him.

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LEARNING OBJECTIVES

LONG-RANGE PERSONAL BEHAVIOR	To become aware of the perceptions and attitudes of inquirers concer
POSSIBLE ENABLING BEHAVIORS	Asks a student to share his theory or the status of his theory
	Names and/or lists the tuning in moves
	Asks a student why he has used a specific operation or why he has used the chosen subject of the operation
	Asks a student to predict or explain a new situation with his theory
	Gives a student a datum or a theory the student hasn't requested
	Gives a datum to a student after the student has indicated he doesn't know what data he needs
	Provides appropriate responses to inquirer actions read from a printed sheet
	Provides appropriate responses to inquirer actions during live workshop enactment when trainee's problem focus is used
	Identifies, by using an observation guide, tuning in moves used by the teacher during a live workshop enactment
	Judges, by using an observation guide and listening to a tape recording, whether the teacher used tuning in moves indiscriminately or in terms of student awareness of inquiry processes
	Provides appropriate responses to inquirers during a practice session working with students

ncerning inquiry processes.

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TYPESCRIPT:
CONFRONTATION TAPE I

Appendix C

Girl	Does the red stuff in the tube move because of light?
Boy	Maybe that red stuff in there is like carbonated water. When you shake the glass the liquid lets off a gas like when you shake a pop bottle. Well, the gas makes pressure and pushes the liquid over.
Girl	If the liquid was like, well, 20 degrees hotter would it still work? I'm not sure but I think the heat makes it move. I need to know if you put something cold on it that wasn't warm at all would it still work....
Boy	Well, could a fly live in the top of one of those little balls? Why does it bubble like that?
Girl	Well, liquids boil at different degrees.... If I wanted to know if, uh, cold would make it go, we could do an experiment by putting ice on it and seeing if it would work.
Boy	Well, when those bubbles, when you held it up and it, when it went into the arch, were those air bubbles when it went up to the other end to the gas ball, uh, glass ball?
Girl	How is that like a thermometer?
Boy	Well, for awhile I thought it worked because of heat now I'm not sure because it also moves when something cold is on there.

Appendix C

TYPESCRIPT:
CONFRONTATION TAPE II

Teacher Well, let me tell you a little bit about what we are going to do. I am going to do a science experiment, I guess you could call it, and then I'll pose a question about it and it is up to you to see if we can figure out what makes it work the way it does.

Student I think we tried this once before last year in school, except they did something and asked us a question about why did this happen and we all gave our theories and we finally got it....

Student And the teacher would answer the question, all she could answer was yes or no.

Teacher Oh, yeah.

Student Or, maybe or, you know, ask you a question and they don't quite understand.

Teacher Well, we'll probably work much the same way, that is, you can ask me questions about it. Some questions I may answer directly and others I may not. You'll see how we'll work that. And a couple of other things, when you did it in your classrooms, those of you who did it, when you were through, did you say "I pass" or anything like that?

Student Usually we said "I pass" or something like that.

Teacher OK, sure. And let's see, you can make as many comments or pose as many questions as you want to at one time. The reason why I say that is so you know you don't have to ask one question and stop, but you can say the kinds of things you want to say or ask the kinds of questions you want to ask, as long as you wish. You have the floor as long as we're looking at you or talking with you. One other thing we'll ask you to do or that you can do, is call for a conference. If, when you're working on a problem, you decide, Mike, that you would like to talk to Stewart or you would like to talk to Charles over here or Tom, if you would like to talk with each other, one way you can let me know is to say, "May we have a conference." We'll stop what we are doing and give you a chance to talk to each other about it. OK? So if you want to talk among yourselves, say, we'll stop the tape and wait a little bit until you get a chance to do it. You know, talk about what you want to talk about, share your ideas or whatever. Then we'll continue from where we left off.

OK. Here is a...

Student Yeah...

Teacher Does this look familiar to you?

Student That's what we used at school.

Teacher Good. Well, we'll see what happens when we try it, OK?

Here is one kind of problem and question that you can worry about, it's, "Why does the liquid move?"

Student Oh, I think I know. The heat in your hand makes...

Student The liquid expands and it flows along...

Student And the heat of your hand makes the molecules in the water rearrange and move faster and faster and it has to go somewhere and so it goes to the other.

Teacher OK

(Silence 30 seconds)

Student Is the liquid, does it go through all of the tube, or does it just run on the side? I mean, if you have a tube like this, I mean, if the liquid just runs on this side and this and all that, and it doesn't go through the middle, does that go all the way through the whole thing?

Teacher Yes, it does, it's like a...the tube is kind of like a hose, and it goes right through the whole tube, yeah, sure.

(Silence 45 seconds)

Student Is that some sort of a chemical in there or is it just something?

Student It's colored water.

Teacher Is it colored water? No, it's not.

Student Is it a chemical?

Student It couldn't be colored water or else it wouldn't do that.

Student Is it a chemical?

Teacher What do you mean by a chemical, Charles?

Charles Well, um, not really water, but um...I don't know just how you would say it, but find a chemical, uh, something that would react more or something.

Typescript:
Confrontation Tape II

Appendix C

Teacher	Are you asking, is there something special about the liquid or something that makes it react more?
Student	Yes.
Student	Could it be sulfuric acid?
Teacher	Is it sulfuric acid? Let me respond to Charles first and then I'll.... I'll tell you what, it just occurred to me that on the tape we are making, that it would be helpful if we gave your names before we speak so we know who is speaking. If you would just raise your hand or something so I know you are going to talk. Then I'll say Charles or you can say your names before you start talking. If Jenny has something to say, you can say "Jenny" and then go on with what you are saying, OK?
	Now, you are asking...I said all those things and I forgot what your question was, Charles.
Charles	Is that something special that will react in a certain way?
Teacher	It could be.
Jerry	Putting your fingers there, does it stop the...that stuff from flowing the other way?
Teacher	Does putting my fingers in here stop it?
Jerry	Yes.
Teacher	It could.
Stewart	Does that kind of pointed thing on the top have anything...on the top of the one thing, does it have anything to do with anything else? With the experiment?
Teacher	I suppose it could have something to do with it.
Student	Can air get in through there?
Teacher	No, it's sealed off tight.
Jerry	Why did they put that there?
Student	Is that just the way they sealed it?
Teacher	Yeah, that's part of the process of the way they make it. Part of the process of making it. Does that answer the question that you were worried about, Jerry?

Jerry Not really.

Teacher Mike, you have a question.

Mike Well, would you tip it...I want to see if it all...it can all fit in one of those things.

Teacher How would you like it tipped over Mike, like this? Do you want me to see if I can get it all in one ball?

Student I want to see if it would go.

Teacher Is that what you wanted me to do? There is still a little bit up there. OK.

Student Do you have to slant the tube at all when you put your hands on it so that the, whatever it is, the liquid will go through it better?

Teacher Charles, could you tell me what you mean by, "Do I have to?"

Charles Well, instead of just holding it like this, uh, if holding it like this, would this make it flow through better or would it....

Teacher Do you want to do something with it?

Charles Would...oh boy, well, I was just wondering (I think I have it) that if tilting it, I mean not having it level, but tilting it, would make it flow through faster?

TYPESCRIPT:
CONFRONTATION TAPE III

Appendix C

Teacher Well, one question that we want to think about is, "Why does the blade bend and then straighten out again?"

All right, Tom.

Tom Ah, could you hold up that blade? Does the one side of the blade have anything to do with it? Because when you held it, it went down once but the second time it went up, so does that have anything to do with it?

Teacher What could you do, Tom, to test that idea?

Tom I suppose we would have to do it over again.

Teacher Do the same thing over again? What would you do over again?

OK, let's go to Charles over here.

Charles Well, ah, is there some certain metal? I thought I saw it when you turned it over. Isn't there bronze or brass or something like that on one side of the blade?

Teacher Yes, brass is on one side of the blade.

Charles Would that affect it, ah, I'm saying would this affect it in the experiment?

Teacher You are coming up with an idea that, maybe because it is brass on one side, it somehow is affected to make it go.

Charles Yes.

Teacher It might, you could experiment to test that idea, Charles.... Okay, you can say "I pass," if you want to think about it.

Charles I pass.

Jerry Each time you did it, you shook it around in the water. Did that have anything to do with it?

Tom Well, I think it made it go back to shape just a little faster.

Teacher That's your theory about that, huh, Tom? Jerry, what would you do to test that idea? What might you do?

Jerry Not shake it.

Jenny You could just leave it out in the air and then just wait and see if it does bend back without the water.

Appendix C

Typescript: Confrontation Tape III

Teacher All right. Both Jenny and Tom have given us some ideas about how to work here. What you can do here is, remember the last time we talked about the fact that if you get some kind of an experiment or an idea for an experiment, even if we can't do it, you can still ask me. You can design an experiment and say, for example, if you didn't shake it in here, would it still bend? Then I can tell you what would happen that way. That's one way you can experiment here without really carrying it out. You still have to design the experiment to test the idea. So if you want to find out, you can experiment in words and find out about it by asking me what would happen. OK. Laura.

Laura Would anything happen if you held it sideways?

Teacher If I held it just so, if I held it sort of flat to the flame, you mean hold it this way?

Laura Yes.

Teacher Yes, something would happen.

OK. Charles.

Charles Well, I was just wondering, would it happen the same way, would it bend the same way as if you just had plain metal, not brass or just plain brass and not metal?

Teacher Well, brass would be metal. Do you mean just one metal?

Charles Yes, just one of the two.

Teacher Now, you are asking me if this blade instead of being made of two metals, stuck together as they are, if it were just one straight metal all the way through, would it bend?

Charles No. Well, if you kinda could tear it apart or something, you would have here, maybe, this side might be metal and this side brass. Would they still work the same way?

Teacher If we could take this one apart, if we could peel off the silver side and then, put just the remaining brass part over the flame, would the brass part bend?

Charles Yes.

Teacher No, it would not.

Charles So the two have to be together before it will work.

Teacher OK, that is your conclusion.

Typescript: Confrontation Tape III

Appendix C

Jenny	If you just had the other one, would it bend?
Teacher	If you just had the silver side, it would not bend.
Charles	I was just wondering about the weight of the brass. When you put it over the flame and it gets kind of soft, will it kind of expand? I think it would bend toward the heavier side. Do you know which is heavier in the middle, the brass or this?
Teacher	The brass is the heavier metal.
Charles	I thought this would always be heavier. If you had it like...
Teacher	How could you test that idea you were just talking about, Charles? You came up with the idea that it always bends with the heavier metals pushing the other stuff down?
Charles	Yes.
Teacher	What would you do to test that?
Charles	I think, maybe what we could do, is put the brass side down.
Teacher	And see what happens?
Charles	Yes.
Teacher	Would you like me to do that or do you want to do it?
Charles	I'll do it.
Teacher	OK. Why don't you go ahead. I'll answer some other questions while Charles is carrying on his experiment. Let's see, Mike.
Mike	Well, after he is done, can I experiment? I want to see what would happen if I hold both ends like this, if the brass will go out that way or go out this way or just the same.
Teacher	You are going to hold the blade at both ends and heat the middle and see what happens?
Mike	Yes.
Teacher	Right, as soon as he finishes you can try that experiment. We are getting experiments all lined up here.
Charles	See how this goofed because the brass is bending up? That puts me on the way to another theory.
Teacher	Do you want to throw out the ones you just had?

Typescript:
Confrontation Tape III

Appendix C

Charles No, I think I might wait and see Mike's theory It just might have the same thing to do with it.

Teacher OK, sure. Let's get back to Mike now. Mike, do you want to come up and test your theory now? You said you wanted to experiment and hold it by both ends and heat the middle. I'll tell you what, you can stand around on the side and then other people that would like to look on will have a chance. Let me get this out of your way here.

Mike It is coming inward.

Student It is going down toward the flame. Are you bending it at all?

Mike No.

Teacher You are not trying to bend it? Just holding it? You don't want to wipe it off? You want to try something with it wet, Lisa?

Lisa I want to see if it will take longer.

Teacher Oh, OK. You want to stand around the back here so they can see.

Student It's sort of evaporating and bending too.

Teacher I think it took just about the same, maybe just a little bit slower with the water on it. Thank you. Jenny.

Jenny Does magnetism have anything to do with it?

Teacher Aha, we have a magnetism theory now. What would you do to test that idea, Jenny?

Jenny Well, you said it always bends toward the silver. Silver is usually, silver is magnetic and I was wondering, you have always been holding it like this so one side faces north and one side faces south. I wondered if that had anything to do with it?

Lisa Un-huh because I held it that way and he held it that way.

Jenny I know, but they weren't, but you never held it like this, you held it like that. You always pointed it this way so one side would either point north or one side would point south.

Teacher You're going to experiment to test your idea, Jenny?

Jenny Well, nothing different than what we have been doing.

Typescript:
Confrontation Tape III

Appendix C

Jerry	You could turn it the other way.
Teacher	Would that help, would Jerry's experiment help?
Jerry	Point it east or west.
Teacher	Which one is north and south here, I don't know.
Students	(All giving the directions)
Teacher	Jerry is going to hold it in a different direction, aren't you?
Jerry	The northern star always points that way.
Lisa	We did it that way.
Teacher	She is pointing it this way this time. No one has pointed the whole blade in that direction yet.
Jerry	It is bending toward the north.
Student	I think it is bending toward the south.
Teacher	Do you want to do another experiment now changing the direction of the blade?
Jerry	Yes, I want to see if it will keep going until it will change. It just keeps on going.
Lisa	Can you really bend it until it bends all the way under?
Teacher	Let's finish with Jenny and then we will do another experiment. What do you think about that?
Jenny	It didn't prove too much more than we did before.
Teacher	OK. All right.

TYPESCRIPT:
CONFRONTATION TAPE IV

Appendix C

Teacher OK, Stewart.

Stewart Would it work if you didn't put...didn't press down...would the, I mean...

Teacher You mean if I just held the rubber membrane on top?

Stewart Yeah, like that, you didn't put your hand on top of it.

Teacher The tube would not go down.

Student It wouldn't at all?

Teacher It would not, no.

Student Does the amount of air in there, does it change at all?

Teacher The air in where?

Student In that little tube.

Teacher Up in here or up in here?

Student In there.

Teacher Now, that is a rough one for me to respond to...I am going to have to know more of what you mean when you say amount. Like, as if there were ah...now there isn't a quart of air in there, but let's use that idea, if there were a quart of air in there, are you saying are there two quarts or one quart or something? Or the same number of air molecules?

Student No, I mean is there ah...not how many air molecules, but how...like if there's two quarts or one quart?

Teacher Oh, you want to know if the same amount is there at all times in terms of quarts of air? The volume of air? No, there is not.

Student Does it change when it goes up or down? I mean would it get...when does the air increase?

Teacher Just before it goes down.

Student Just before it goes down?

Teacher Yes.

Student Does it increase just before it goes up?

Teacher That's correct.

Student Would you prove it? I mean is it possible to prove it? Can I put my hand on it and see?

Teacher I don't know exactly what you mean by, ah, "Can you prove it?" Do you mean you want to watch the...

Student Yeah, would you put the tissue on it?

Teacher In other words, you want me to do it again so you can look?

Student Yeah.

Teacher OK. What are you going to be looking for, Mike, when I do this?

Mike To see when the air decreases in it and when it increases in it.

Teacher OK.

Lisa If you didn't have...suppose it was down here and if you just didn't cover the whole top, you know, could you just cover a part of it and do it, would it still work? I mean like if you used this and...the water...

Teacher Oh, yeah, I understand, OK. In other words, if I didn't cover the whole thing, but just covered part, could I make it come back up, is that what you are asking?

Lisa No, I mean, when...not when it is going up...

Teacher You mean when it is down on the bottom?

Lisa Yeah, when it is down on the bottom.

Teacher No, if I just covered part of it, it would not...it would not come up to the top. You know what that was that you just did, Lisa? What kind of an experiment? Like changing something.

Jenny Does buoyancy have anything to do with the little squeezer and the water inside the tube?

Teacher What would you need to know Jenny, to decide that?

Jenny You would need to know if there is enough air in the squeezer to have enough...ah, pressure to float and then when you press down on it and all the air is up at the top, and maybe the water inside the squeezer is too heavy and it just went down to the bottom?

Teacher Well, you can ask me both of those things.

Jenny Well, is there enough air in the squeezer to rise up to the top?

Teacher You mean to keep it up at the top?

Jenny Yeah.

Teacher Yes, there is.

Jenny And when you press down, is the water inside of it heavy enough to keep it down?

Teacher The water that is inside is heavy enough to keep it down. That is correct.

Jenny I pass.

Teacher OK, Tom.

Tom Well, if you weren't using anything like a tube, would it still work? Still go up and down, if there were...

Teacher What would you use other than a tube? You mean this tube here? If you weren't using this?

Tom No. The tube inside.

Teacher The tube inside.

Tom Uh-huh.

Teacher What would you use instead of that?

Tom I don't know.

Student A hollow test tube.

Teacher We can make it work with a hollow test tube or a jar.

Student Well, would it?

Teacher Yes, we can make it work.

Student	Oh, and a...if you put that on top, could you make it go down to about...could you make this little tube go down to about there.
Teacher	Down to about 500?
Students	(Talking all at once)
Teacher	I can make it go down to 500 or 300 or 200 or wherever I want to make it go and stay there.
	(Experimenting)
Teacher	Go down to 300.
Student	Yeah 300, now let it up a little bit.
Teacher	OK. I can bring it up to 200.
	Up to 100.
Student	Leave it at 300.
Students	(Talking all at once)
Teacher	OK. I'll put it at 300 and I'll take my hand off.
Student	Or 250.
Student	It's up there...it's halfway.
Teacher	Oh, I'm sorry I was--on this side it's different. So you want it halfway.
Student	And now take the whole thing off.
Teacher	Tom, will you hold the bottom of this for me so that when I take it off there will be no danger of my tipping it over. Is it at 300 now?
Students	Yeah...about.
Students	There it goes.
Teacher	What was it, Tom, that you just did? Do you know what you call that?
Tom	That would be an experiment.
Teacher	OK. Were you testing an idea, Tom? Can you share the idea you were testing?

Typescript:
Confrontation Tape IV

Appendix C

Tom Well, I was just wondering if it would stay there since it stays at the bottom and at the top.

Teacher You were trying to see if it would stay in the middle?

Tom Uh-huh.

Teacher And experimenting to find out whether it would. Sure.

Jerry Would the same thing happen if you filled the whole thing exactly to the top and would there be enough air to push it down, push it up?

Teacher OK. If we were to fill the liquid right up so that it is even with the top, and I would put this rubber on it here, and push down...it would go down in the same way and come back in the same way.

Jerry Why does it need that much...it doesn't need that much air, does it?

Teacher That's your conclusion.

OK. Were you experimenting with an idea there, Jerry? Or just trying to work out a theory?

Jerry Sort of working out.

Teacher OK.

Mike Well, I was trying to ask what Stewart was doing, and when he said um...if there...when there's air at...when the air is in there and when there is air from there to there, you put your hand on it, which one did he mean?

Teacher Stewart asked me about the air inside. He said that this... volume of air gets smaller. Isn't that correct, Stewart? That is what you were asking me...about the air in the little tube. Yeah. That's what he was asking me.

Jerry Well, say that was all full of water...there would be much different results, wouldn't there?

Teacher No. What, the little tube here?

Jerry Uh-huh.

Teacher Oh yes.

Jerry If it was always.

Teacher It would just stay down at the bottom. That's what you predict would happen, huh?

Jerry Yes.

Teacher OK.

Charles Well, I was kind of wondering, when you push the rubber over and down the side over that, when you push, is there a sound when you push?

Teacher No.

Charles When you...ah...would...does the pressure of the water and the pressure of the air, you know, because the little tube is still just about halfway, I was wondering, um... if it was...as you said, you know, earlier I said if it wasn't filled as much, it would stay down at the bottom, well, could you bring it up anyway then?

Teacher Could I bring it up anyway if what, Charles?

Charles If the tube had more water and less air in it.

Teacher No.

Charles No, I mean...

Teacher Oh, this tube here?

Charles Yeah.

Teacher Oh, I'm sorry--I could make it go up and down if it were down to, probably, about 250. I don't know exactly what the point is, but we would have a point at which I could push down and it wouldn't react. And it would be down around a little bit less than halfway full of water--the rest full of air in this big tube. OK. Tom.

SEVEN-MEETING WORKSHOP DESIGN

Appendix D

Below is a seven-day workshop design which requires seven meeting days of approximately 360 minutes each. These days should be consecutive or over a period of time not to exceed three weeks. If it is impossible to use consecutive days, the workshop should be arranged in two-day, two-day, three-day periods of time. Except where specified in the subsets, times do not include break periods.

Meeting Number	Subsets	Time Required
1	Subset 1 Subset 2 Subset 3 Subset 4	289 Minutes
2	Subset 5	290 Minutes
3	Subset 6 Subset 7 Subset 8	289 Minutes
4*	Subset 9 First Classroom Practice Tape Subset 10 Subset 11	197 Minutes Plus Time for Practice
5*	Subset 12 Subset 13 Second Classroom Practice Tape	296 Minutes Plus Time for Practice
6	Subset 14 Subset 15 Subset 16 Third Classroom Practice Tape	293 Minutes
7*	Subset 17 Fourth Classroom Practice Tape Subset 18	179 Minutes Plus Time for Practice

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*Each participant will need to have access to a group of from 8-12 students for practice during these meetings.

FOURTEEN-MEETING WORKSHOP DESIGN

Appendix D

Below is a fourteen-day workshop design where weekly meetings are approximately 180 minutes each. This fits the usual extension class or division of continuing education schedule. Except where specified in the subsets, times do not include break periods.

Meeting Number	Subsets	Time Required
1	Subset 1 Subset 2	160 Minutes
2	Subset 3 Subset 4	129 Minutes
3*	Subset 5	145 Minutes
4*	Subset 5	145 Minutes
5	Subset 6	115 Minutes
6	Subset 7 Subset 8	174 Minutes
7	Subset 9	111 Minutes
	First Classroom Practice Tape**	
8	Subset 10 Subset 11	86 Minutes
9	Subset 12	144 Minutes
10	Subset 13	152 Minutes
	Second Classroom Practice Tape**	
11	Subset 14 Subset 15	169 Minutes
12	Subset 16	124 Minutes
	Third Classroom Practice Tape**	
13	Subset 17	105 Minutes
	Fourth Classroom Practice Tape**	
14	Subset 18	74 Minutes

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*Subset 5 is a long one. On this schedule it is divided into two meeting times. The second half of this subset might be assigned for trios to complete out of class. The participants, however, should complete all of the exercises in each subset.

**Participants should practice with students from their own classrooms.